

APPENDIX A

Maps

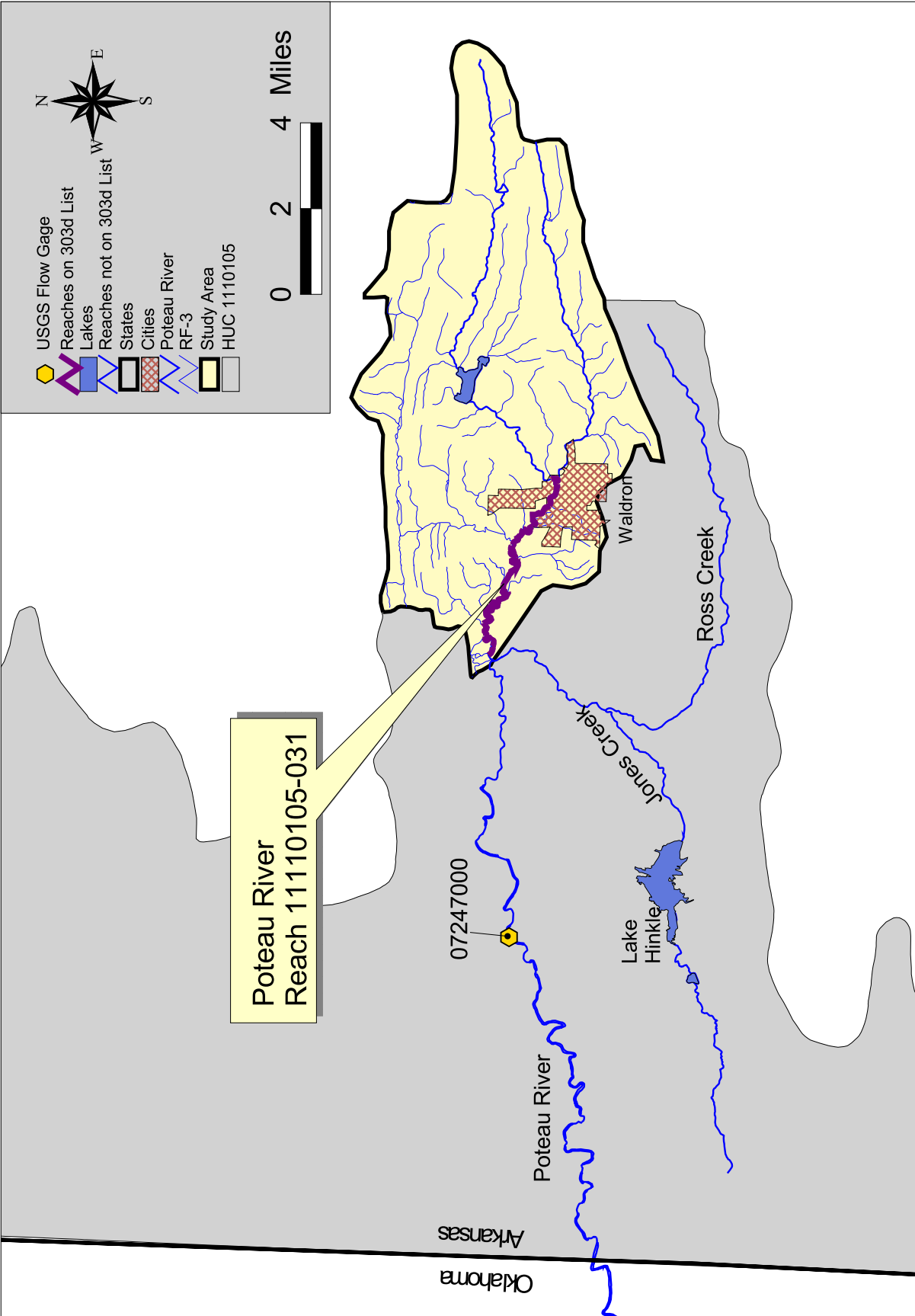


Figure A.1. Map of the study area.

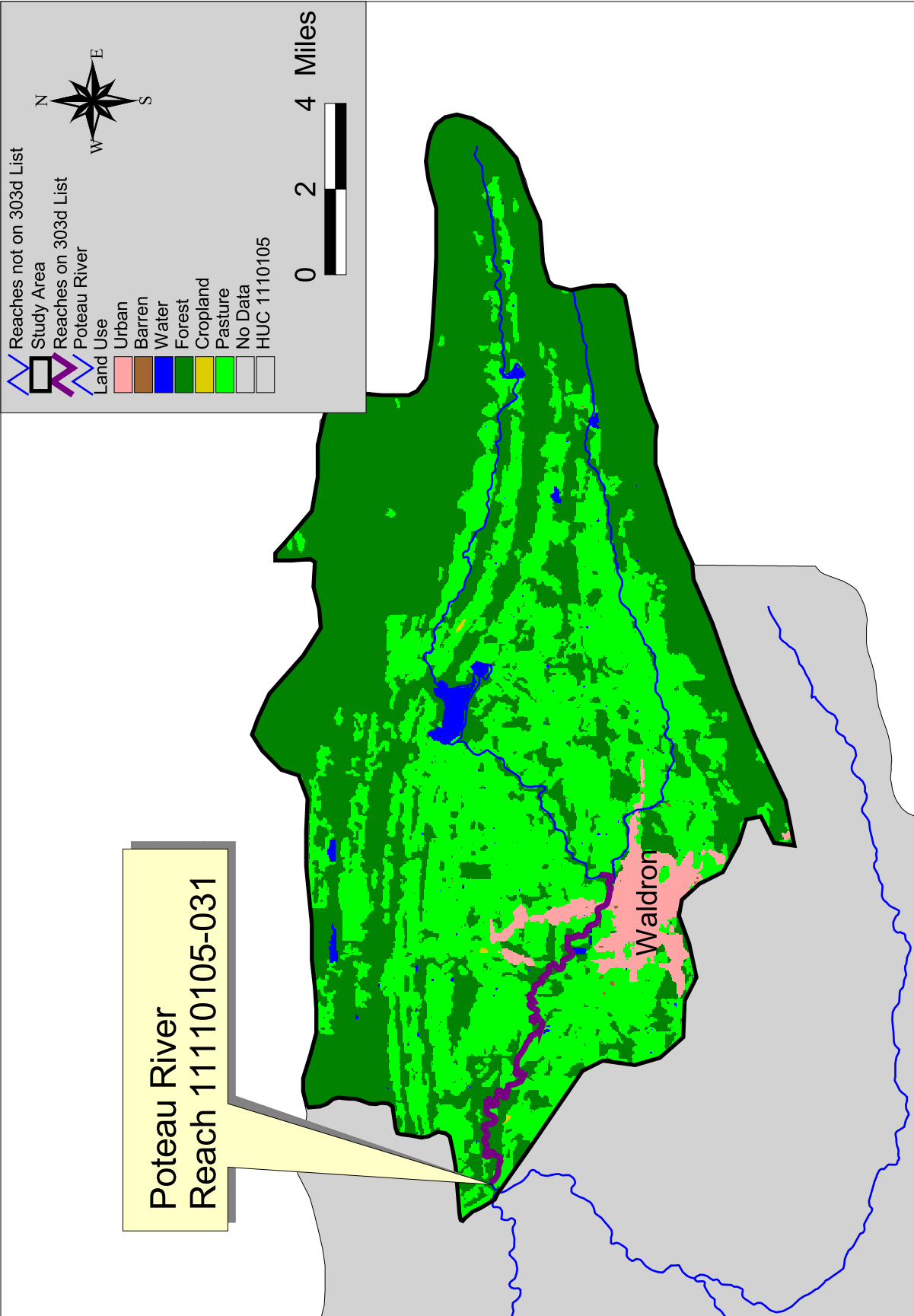


Figure A.2. Land use map.

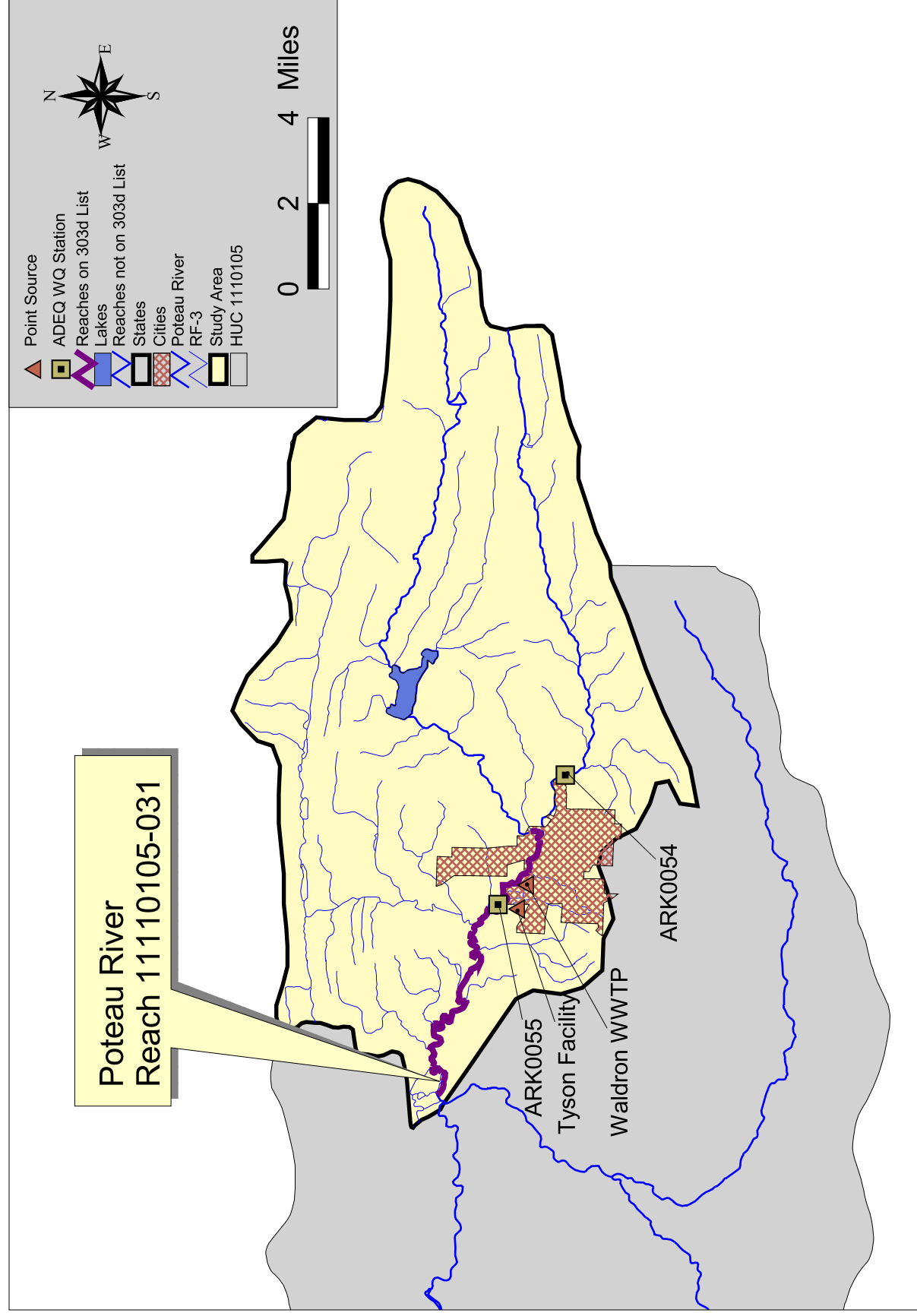


Figure A.3. Map of point source locations and water quality stations.

APPENDIX B

Time Series Plots of Water Quality Data

Figure B.1. Time Series Plot of Total Phosphorus Concentrations at Station ARK0054

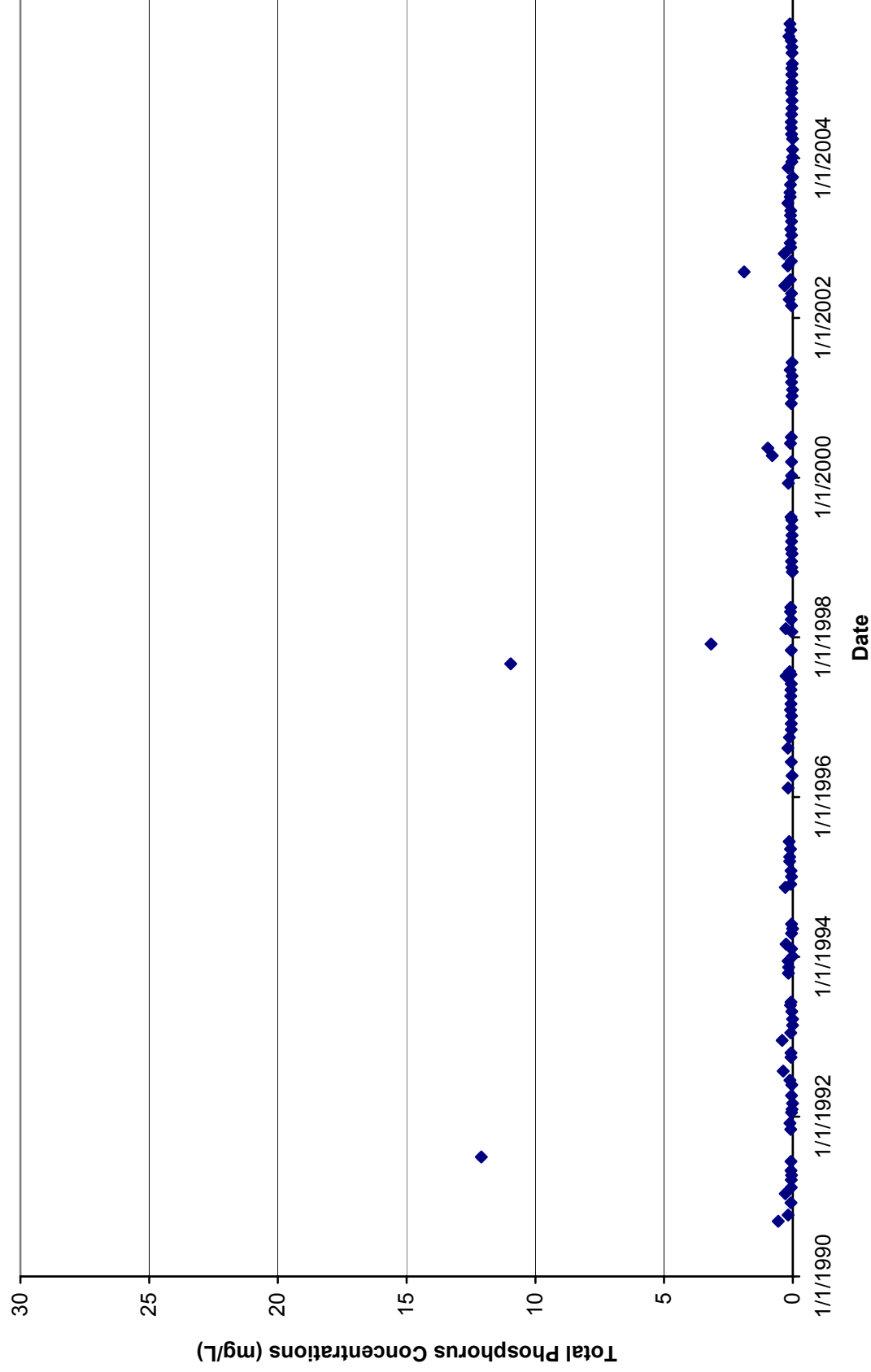


Figure B.2. Time Series Plot of Total Phosphorus Concentrations at Station ARK0055

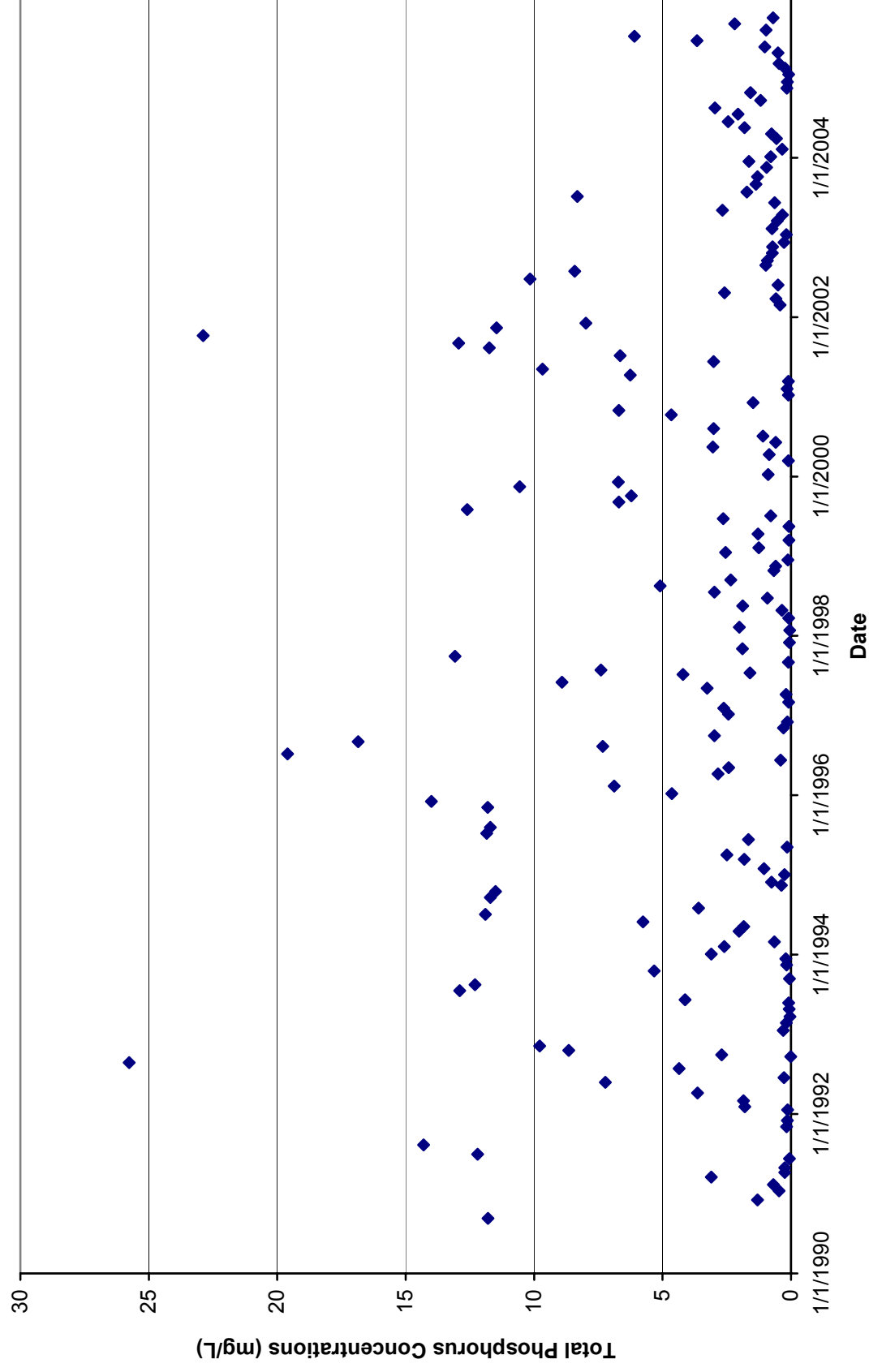


Figure B.3. Time Series Plot of Dissolved Copper Concentrations at Station ARK0054

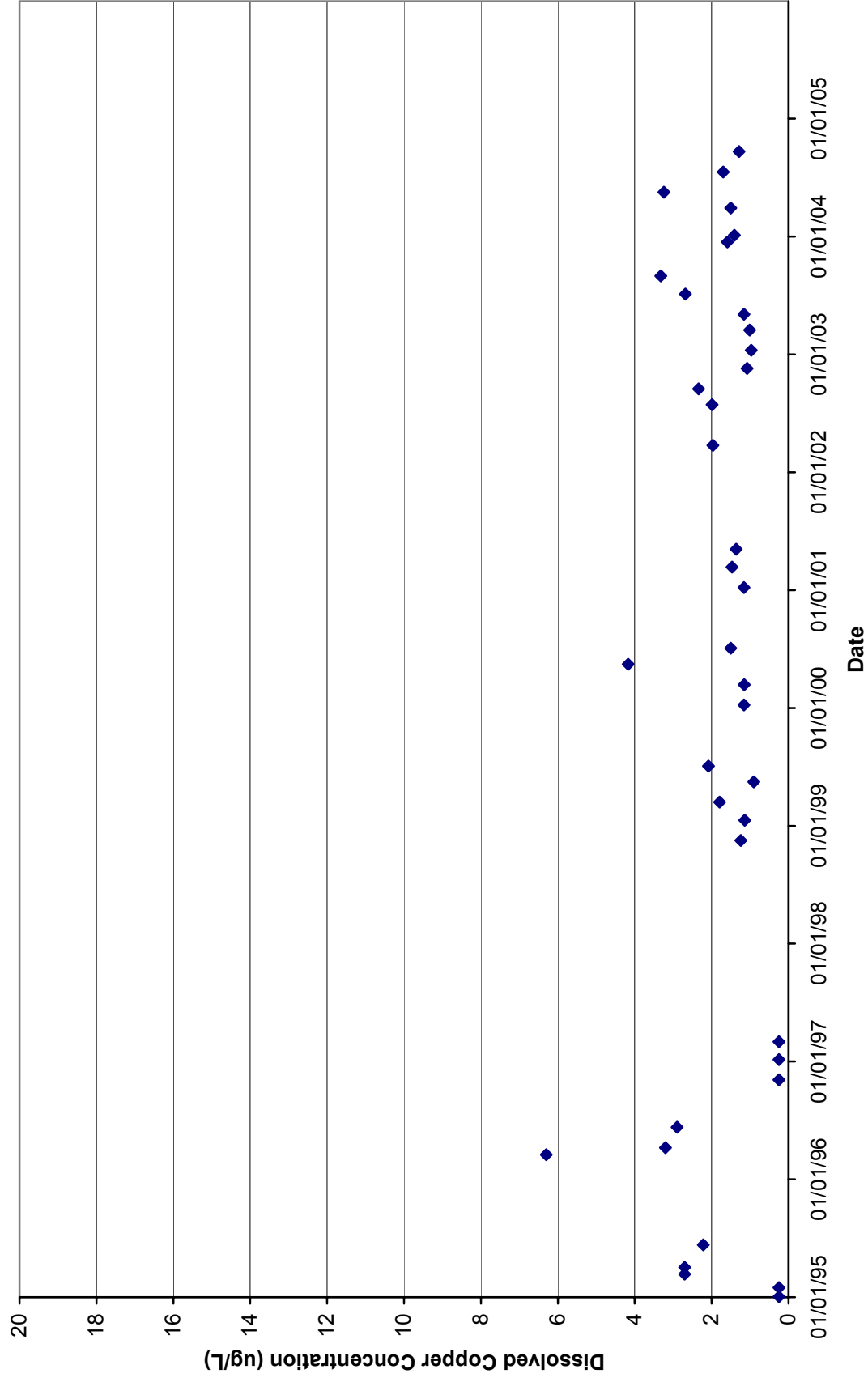


Figure B.4. Time Series Plot of Dissolved Copper Concentrations at Station ARK0055

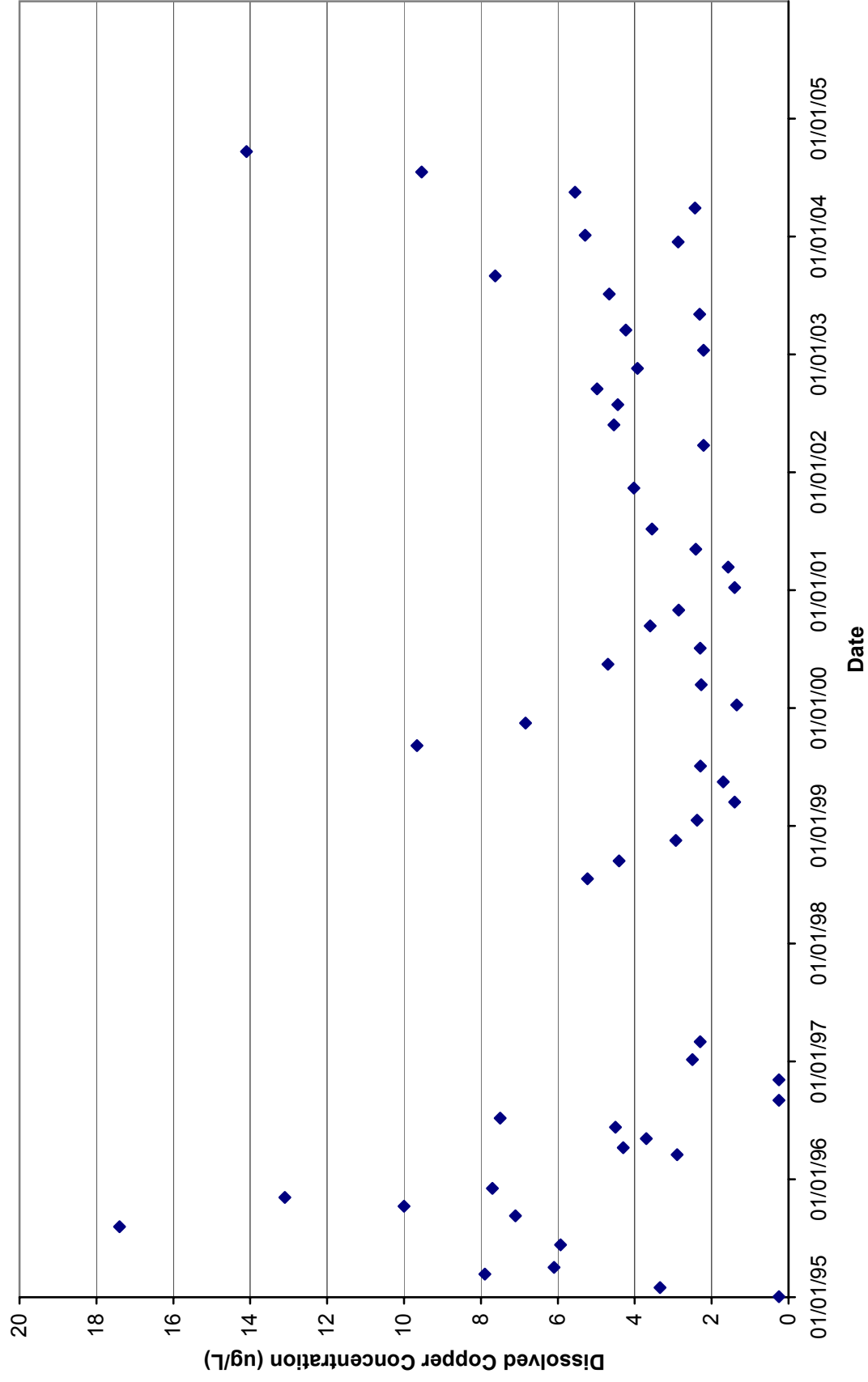


Figure B.5. Time Series Plot of Dissolved Zinc Concentrations at Station ARK0054

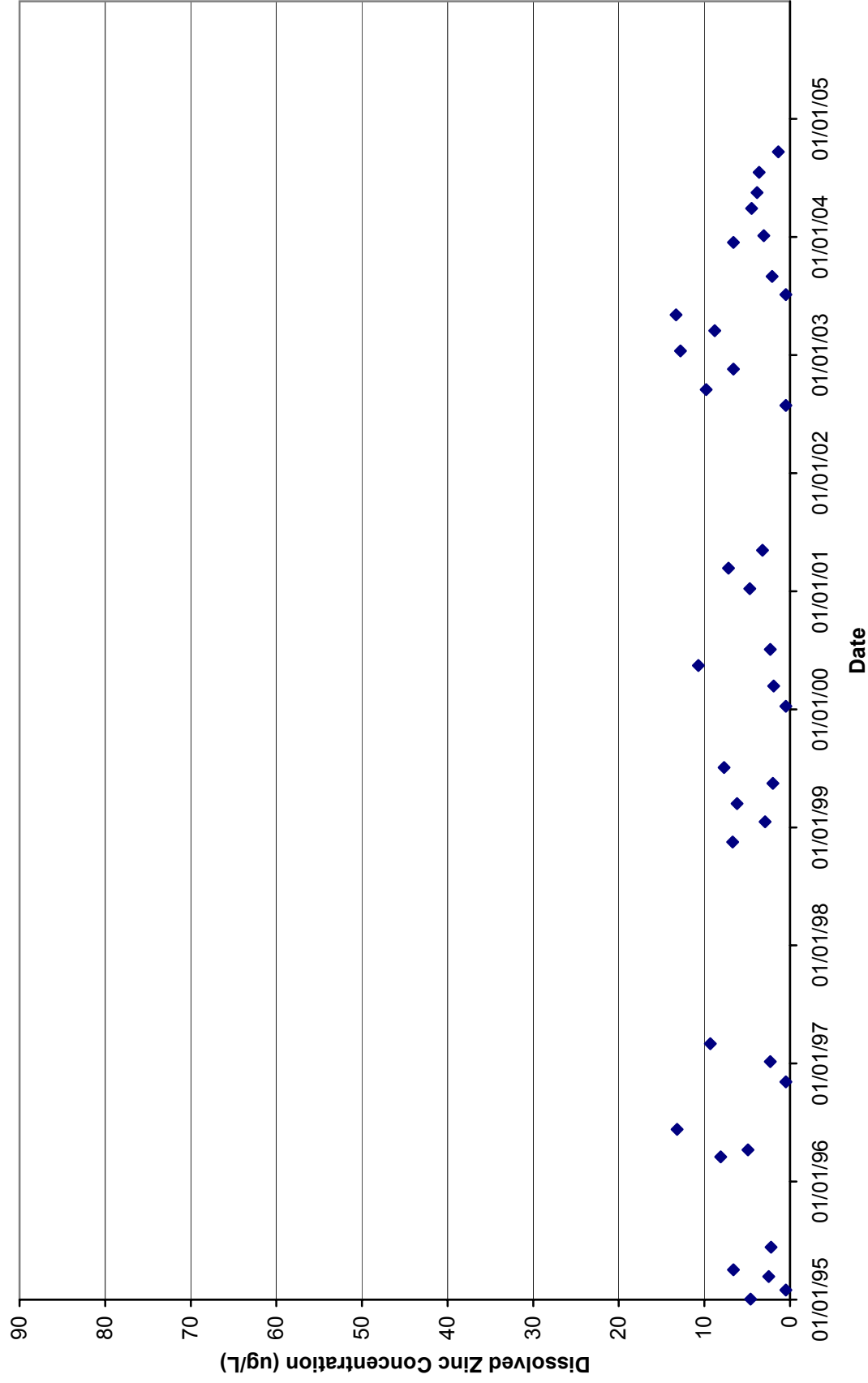
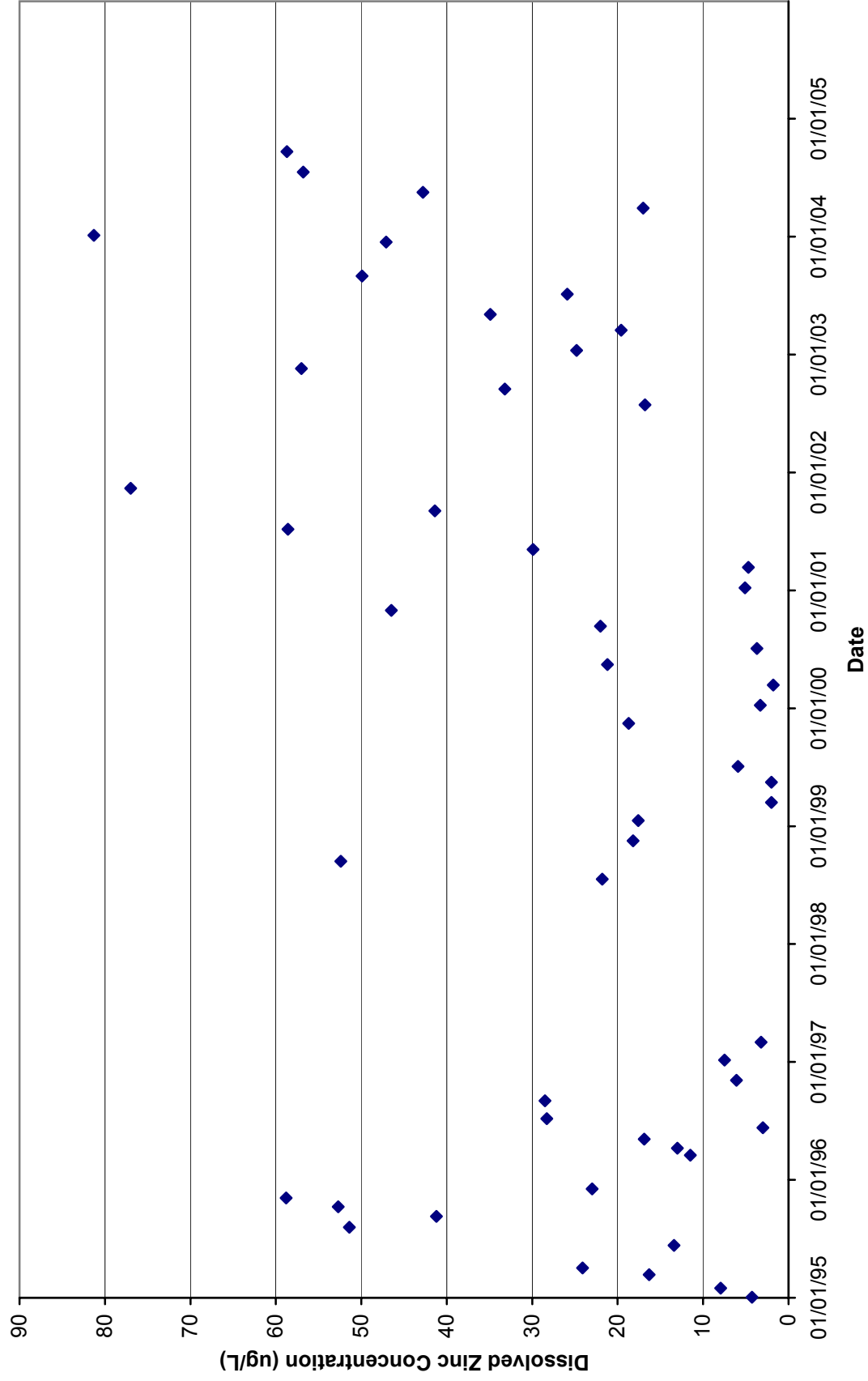


Figure B.6. Time Series Plot of Dissolved Zinc Concentrations at Station ARK0055



APPENDIX C

Seasonal Plots of Water Quality Data

Figure C.1. Seasonal Plot of Total Phosphorus Concentrations at Station ARK0054

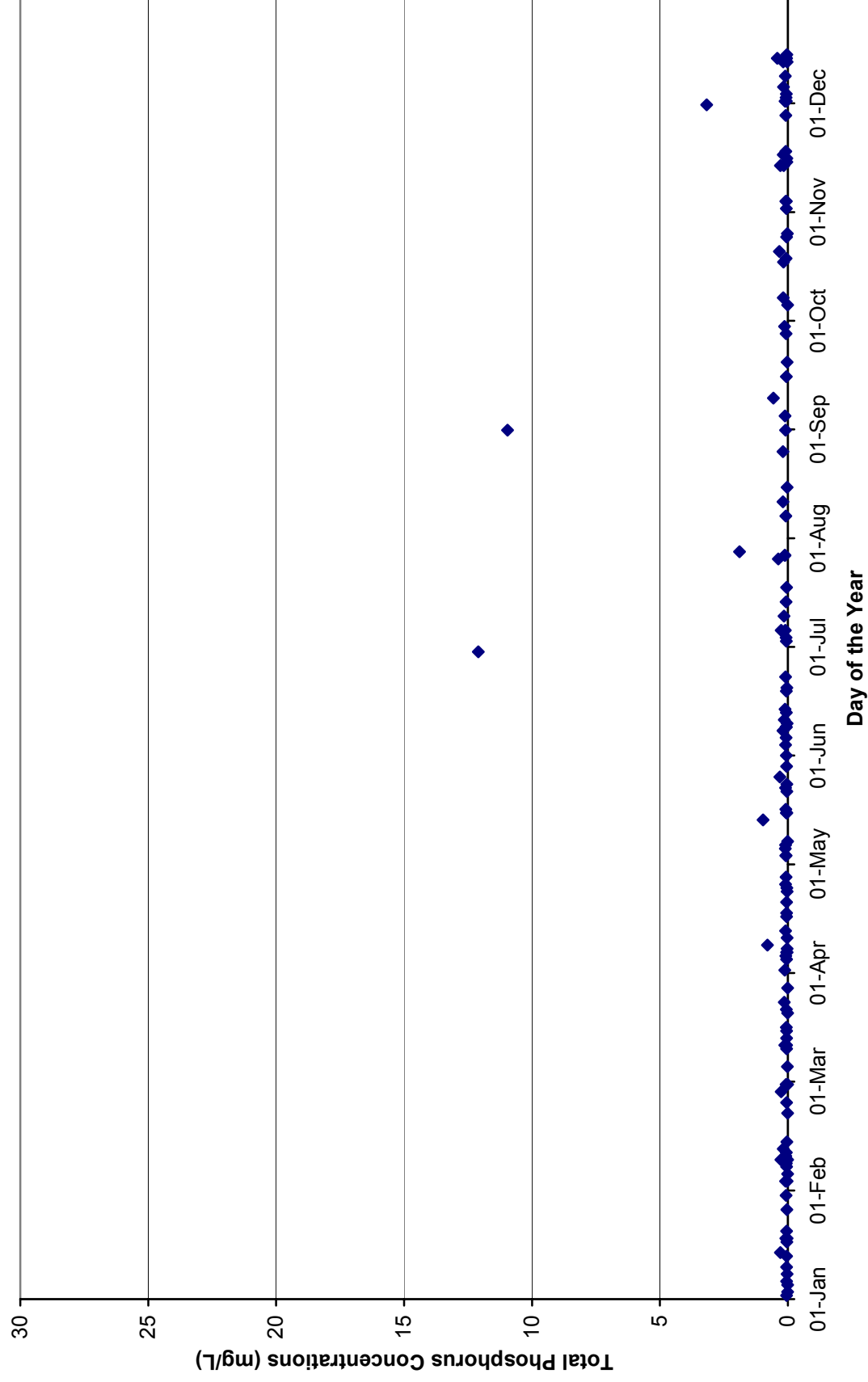


Figure C.2. Seasonal Plot of Total Phosphorus Concentrations at Station ARK0055

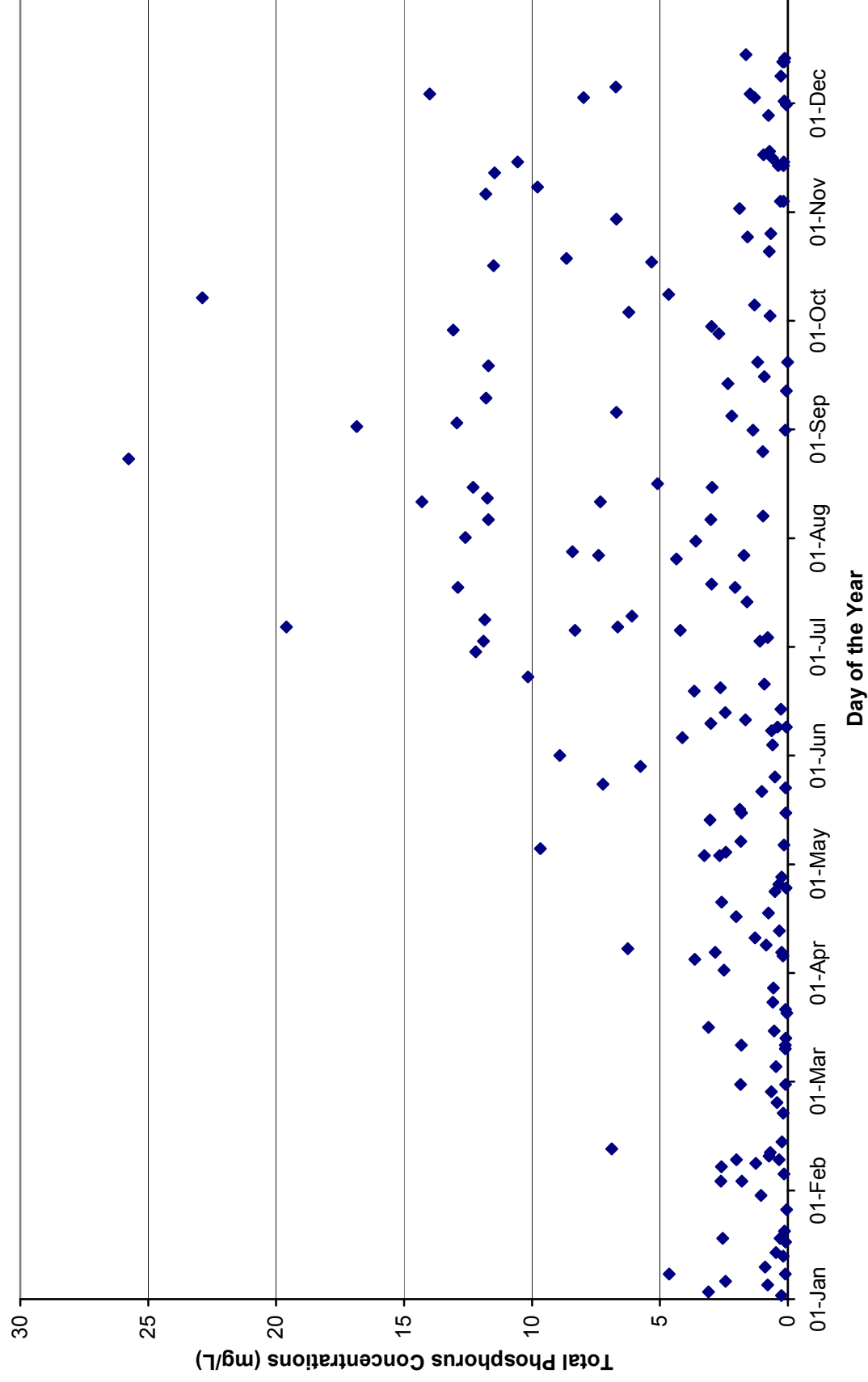


Figure C.3. Seasonal Plot of Dissolved Copper Concentrations at Station ARK0054

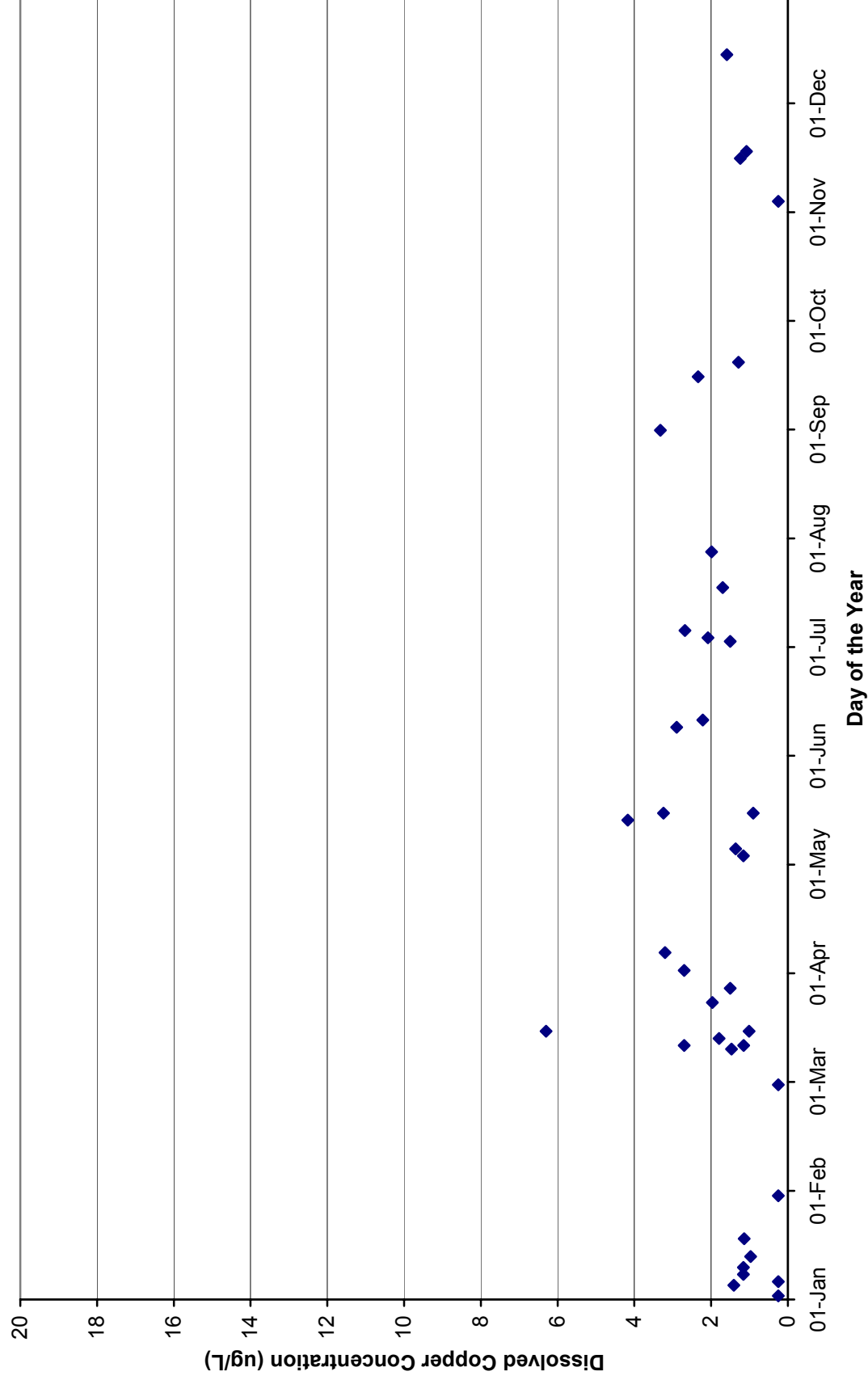


Figure C.4. Seasonal Plot of Dissolved Copper Concentrations at Station ARK0055

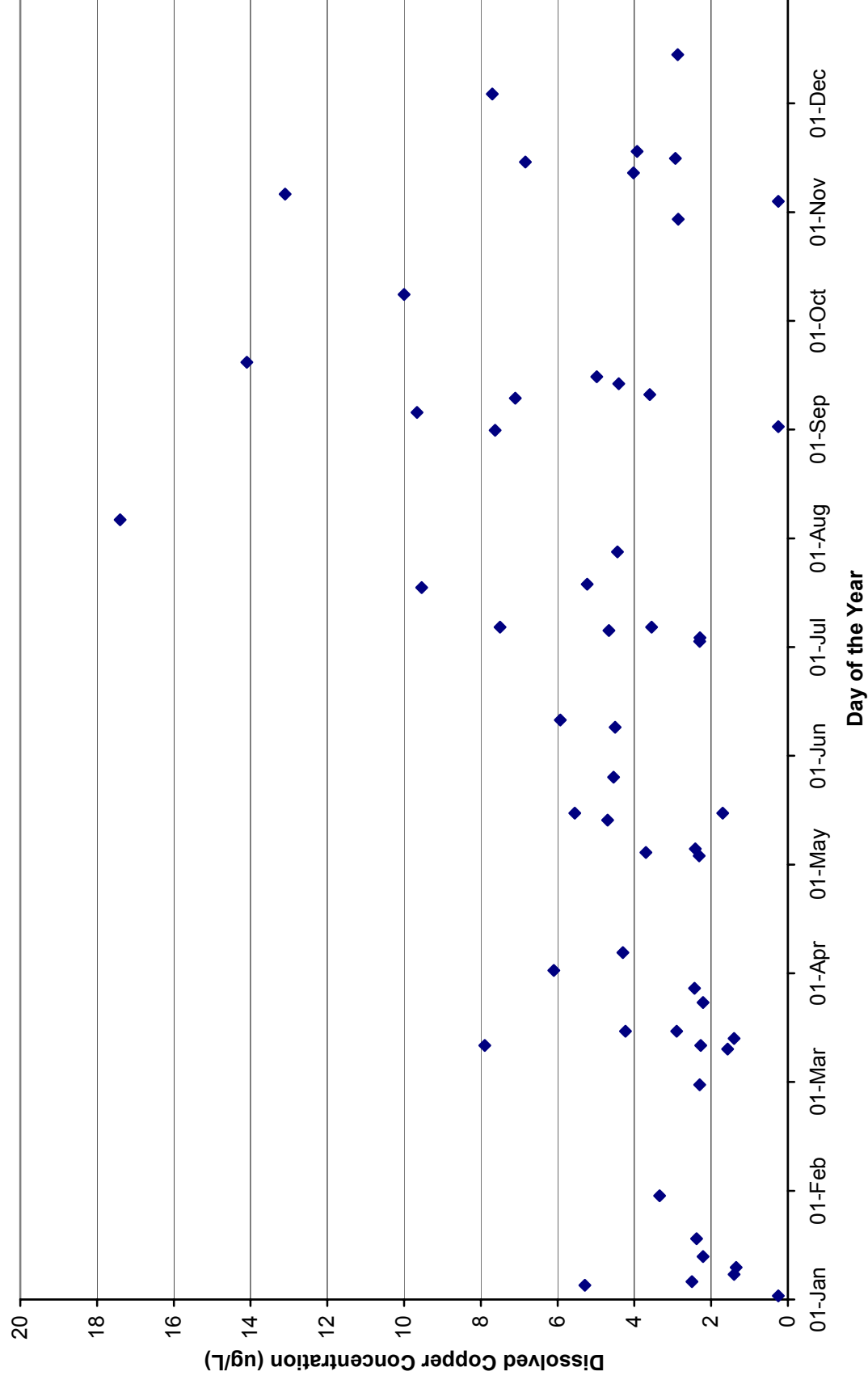


Figure C.5. Seasonal Plot of Dissolved Zinc Concentrations at Station ARK0054

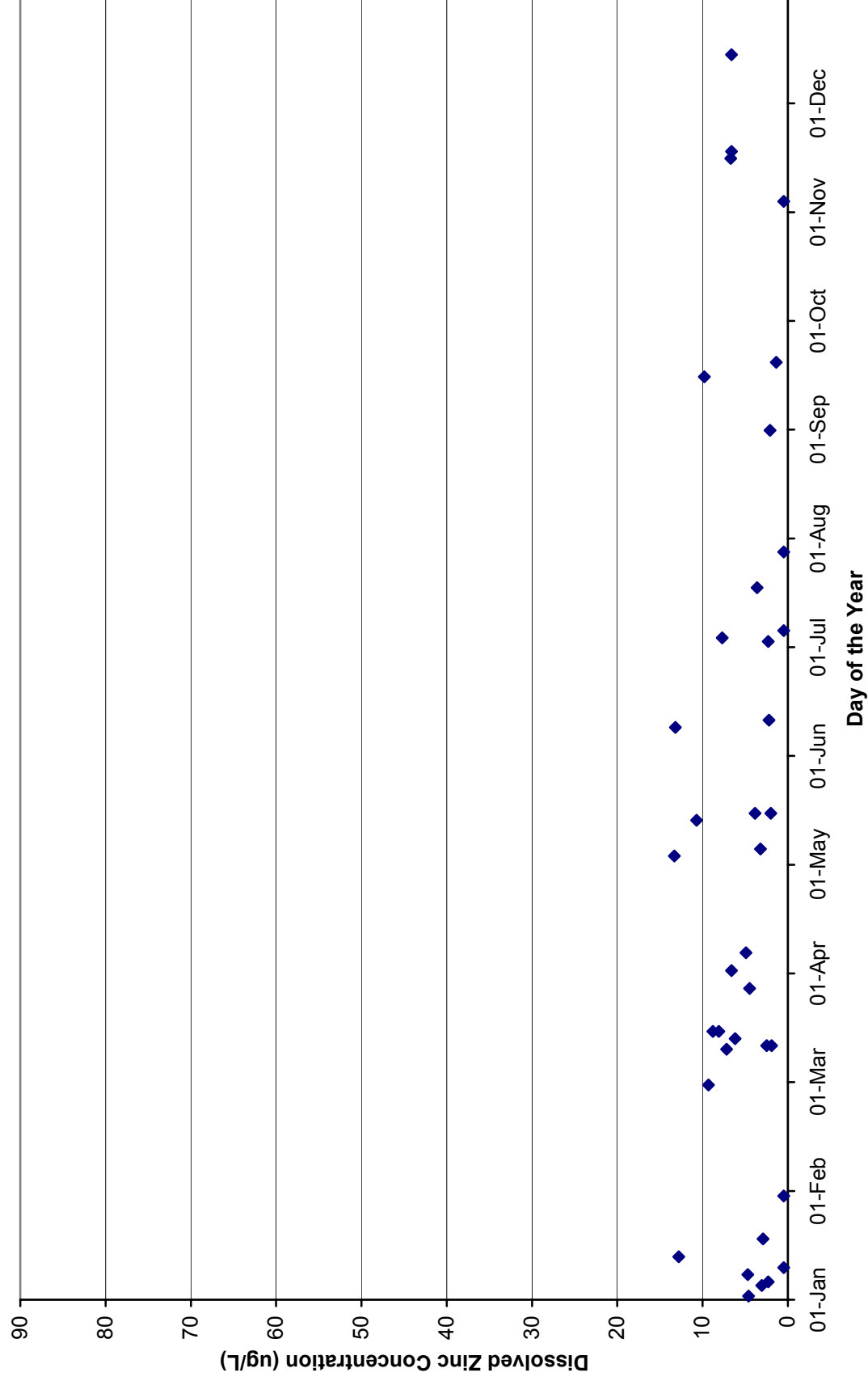
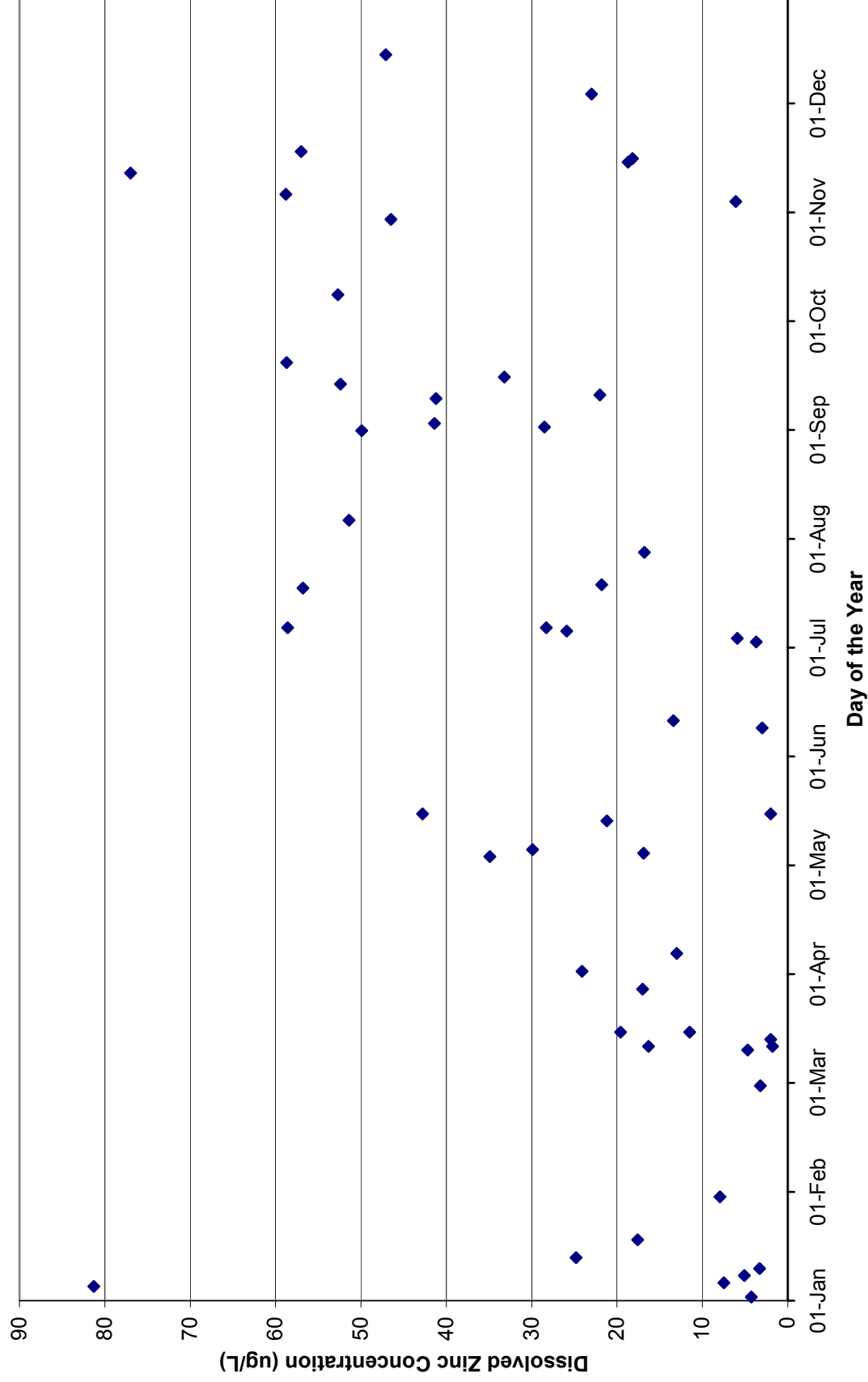


Figure C.6. Seasonal Plot of Dissolved Zinc Concentrations at Station ARK0055



APPENDIX D

Concentration vs. Flow Plots

Figure D.1. Plot of Total Phosphorus at Station ARK0054 versus Stream Flow

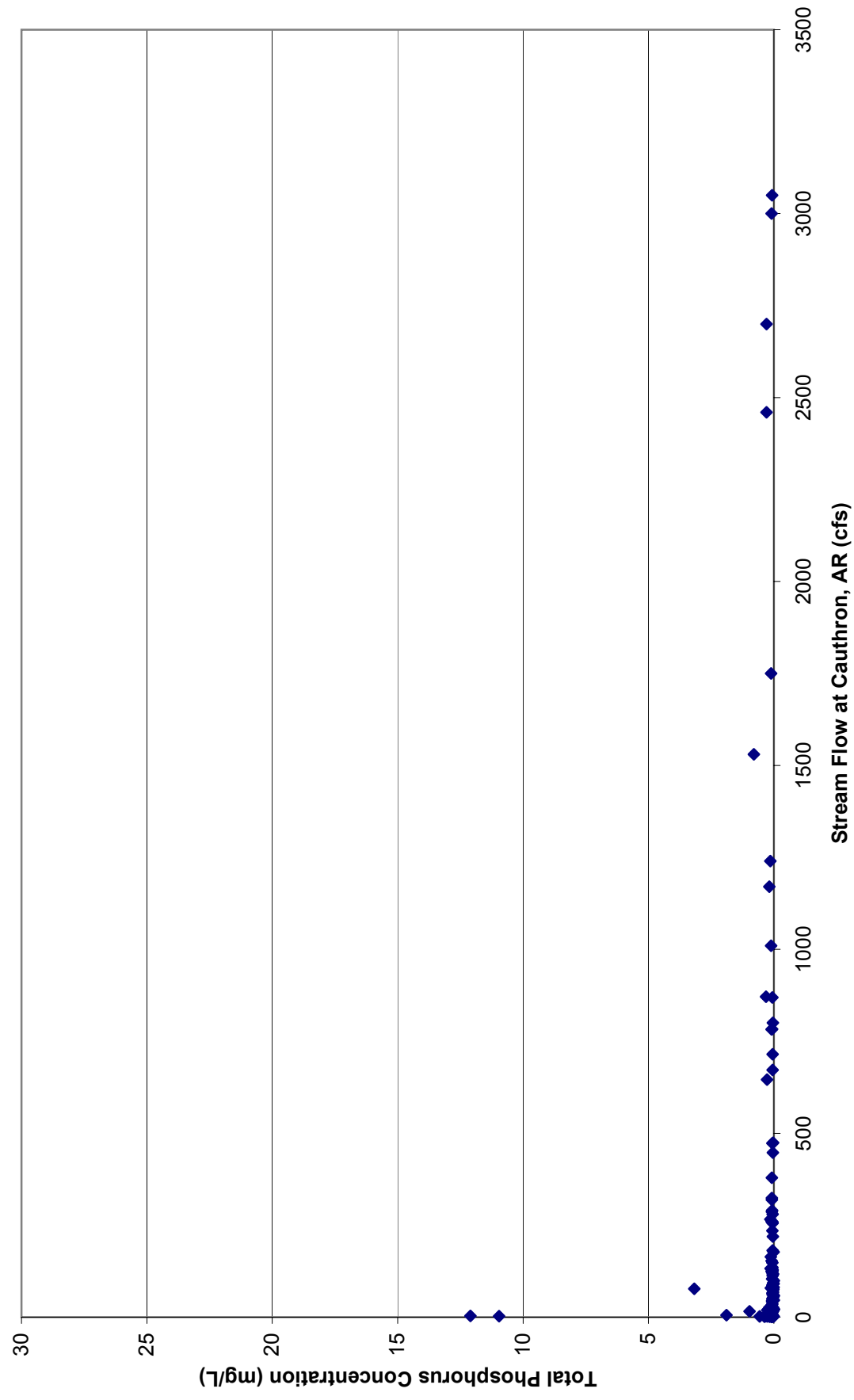


Figure D.2. Plot of Total Phosphorus at Station ARK0055 versus Stream Flow

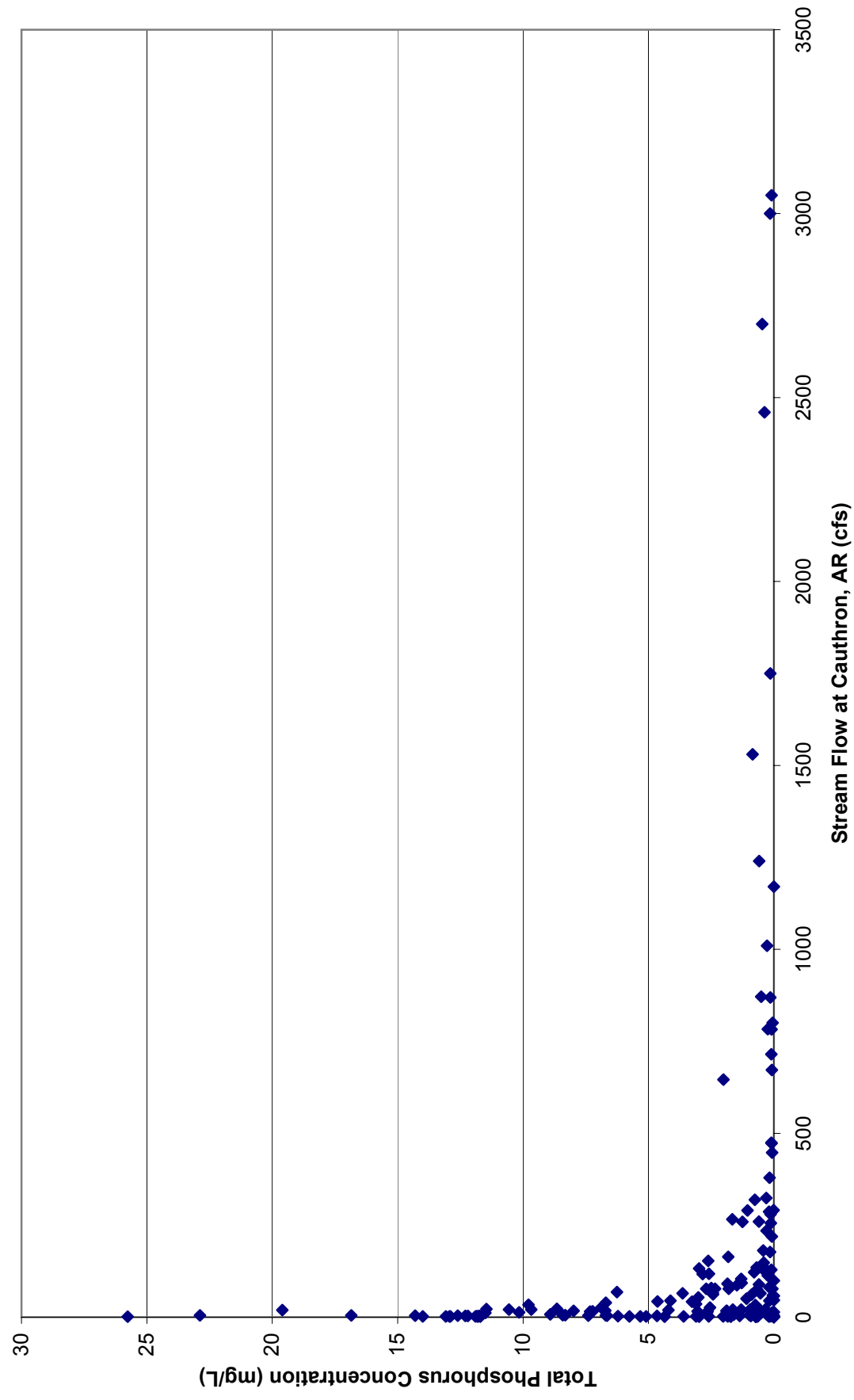


Figure D.3. Plot of Dissolved Copper at Station ARK0054 versus Stream Flow

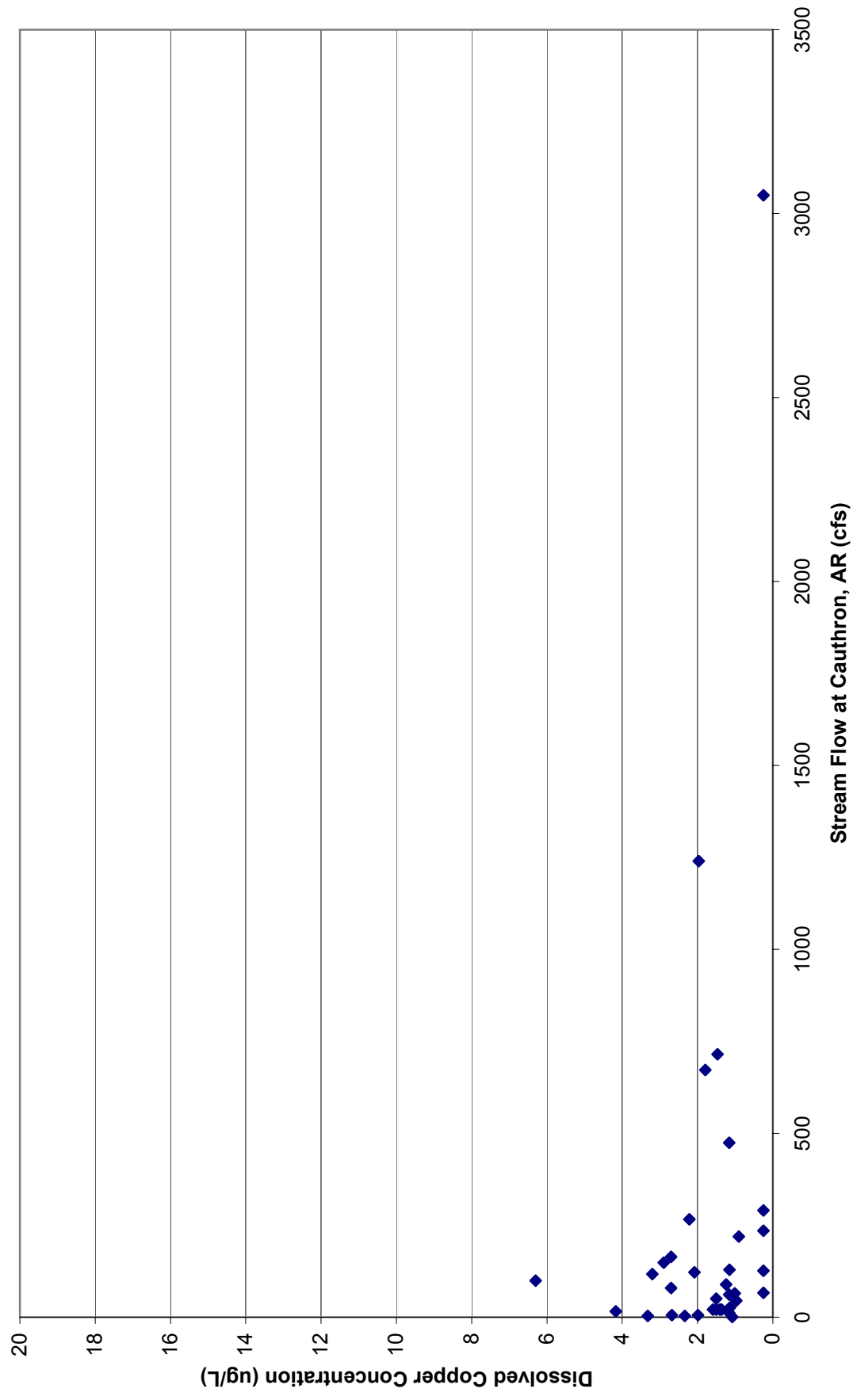


Figure D.4. Plot of Dissolved Copper at Station ARK0055 versus Stream Flow

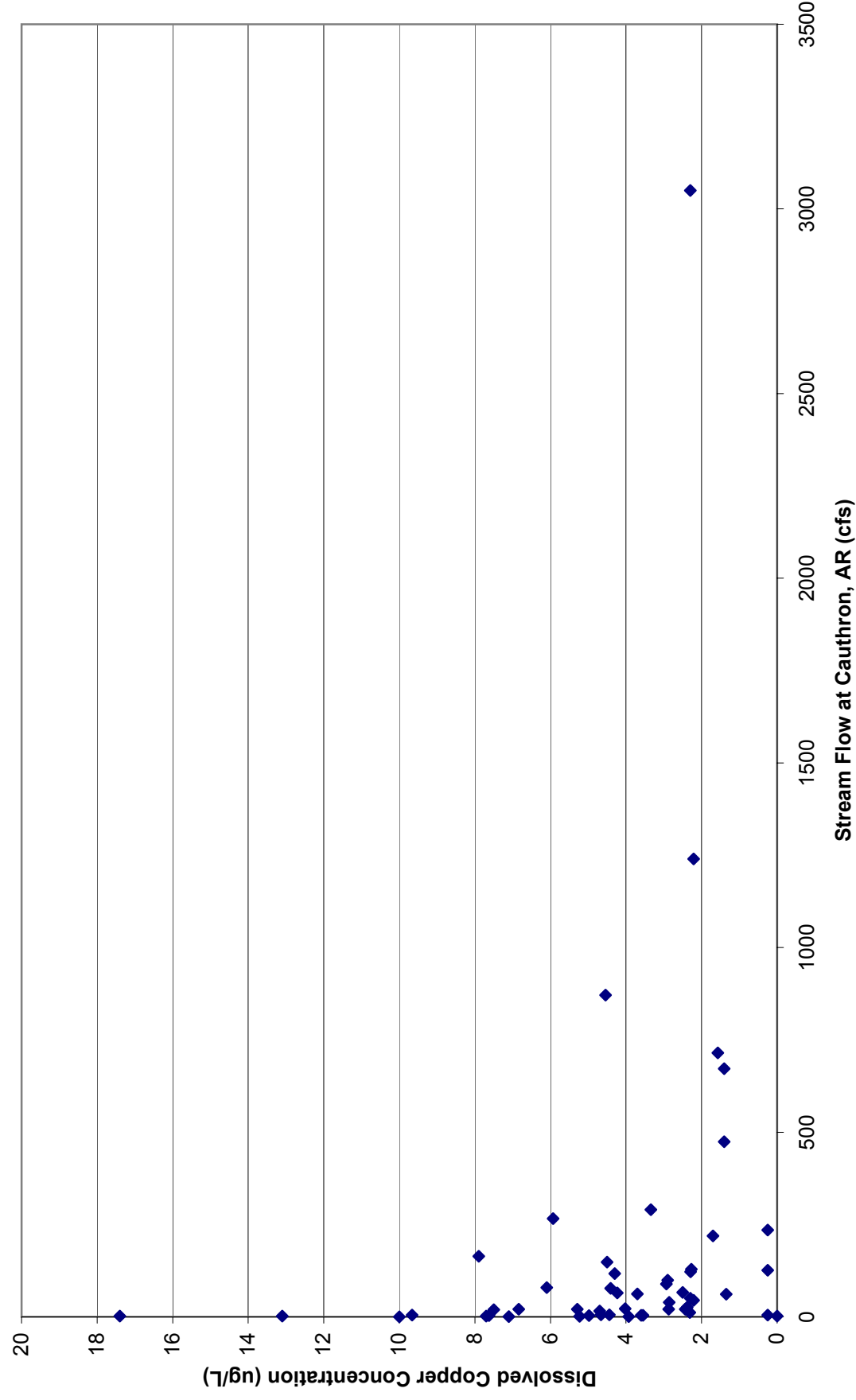


Figure D.5. Plot of Dissolved Zinc at Station ARK0054 versus Stream Flow

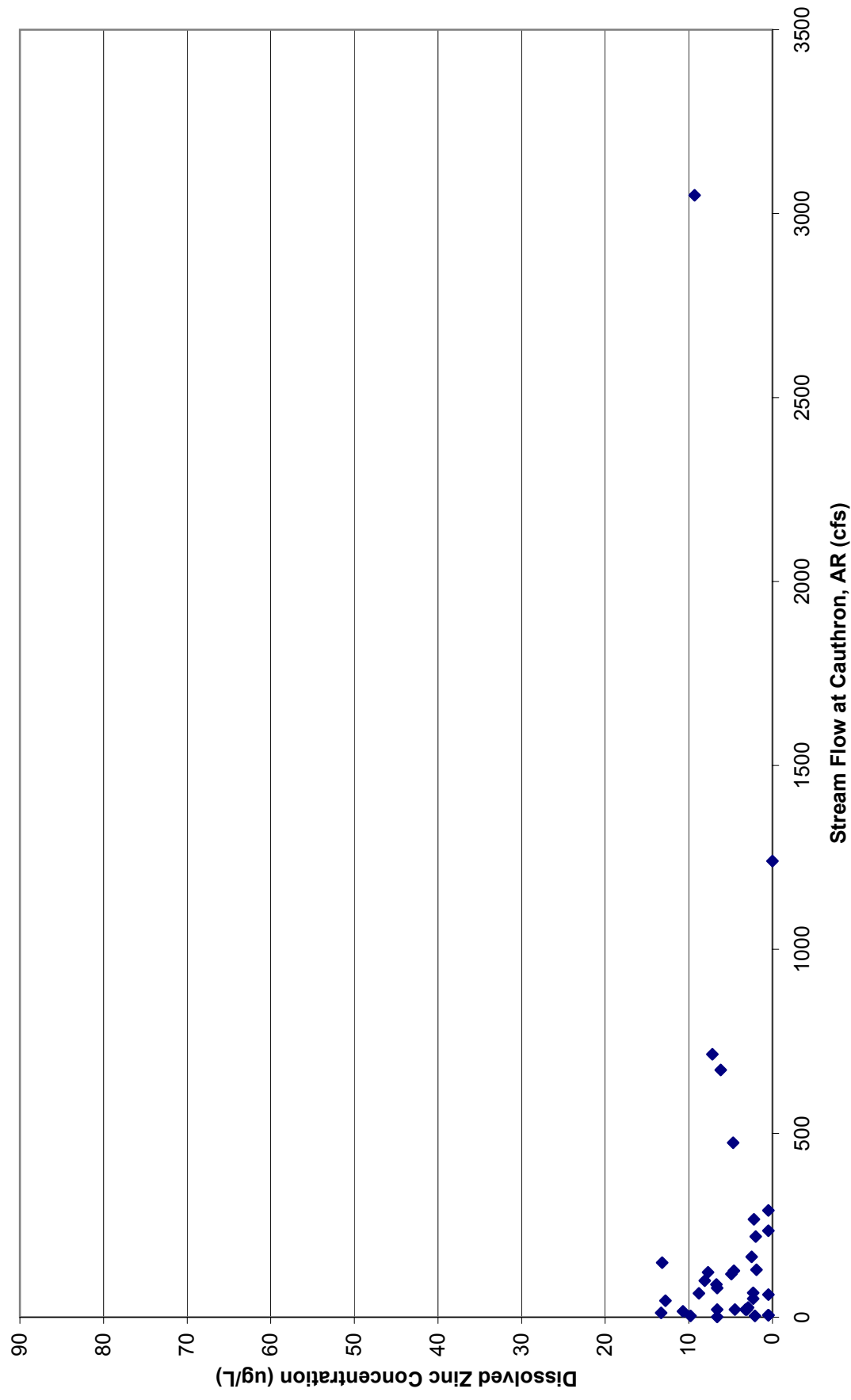
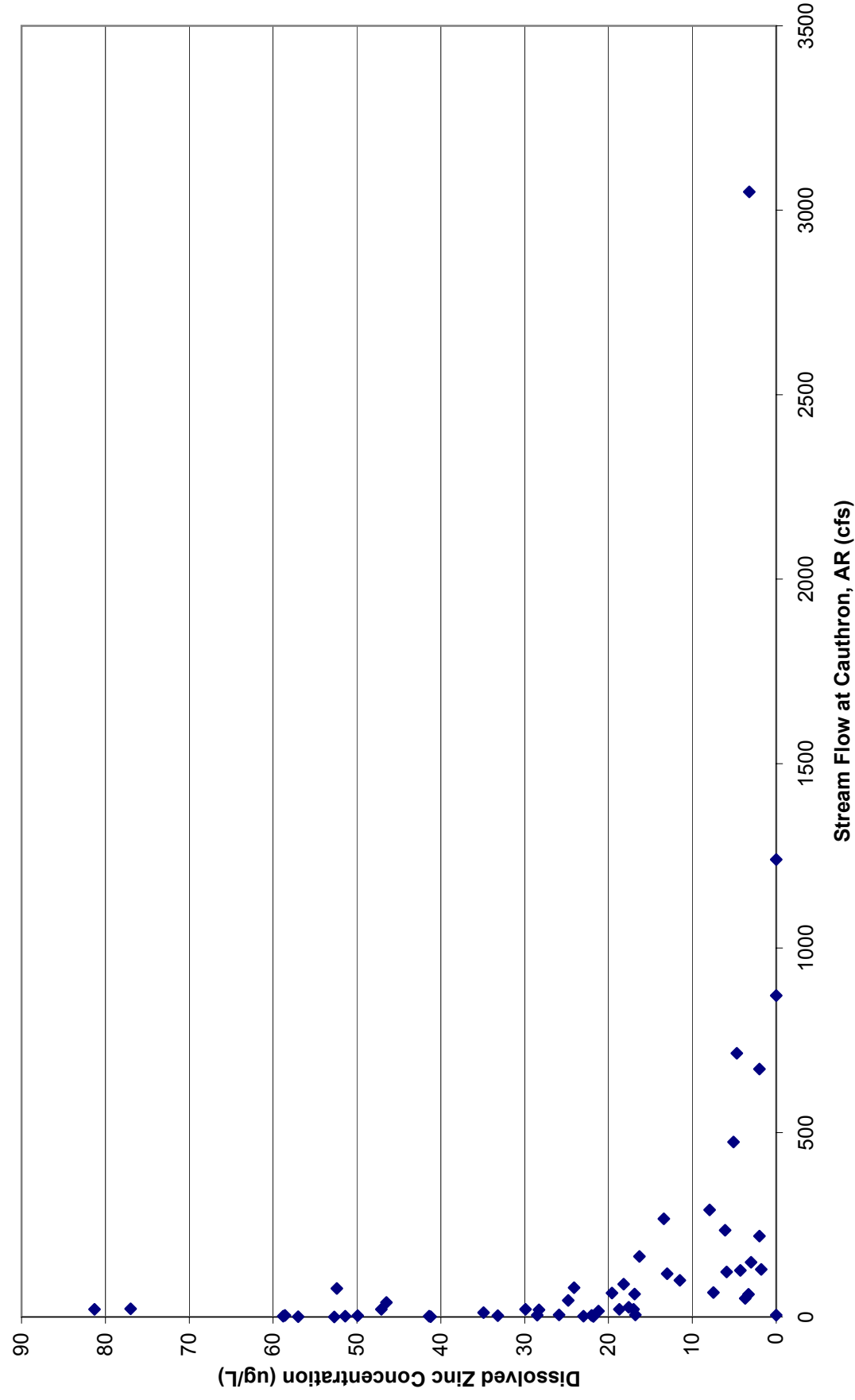


Figure D.6. Plot of Dissolved Zinc at Station ARK0055 versus Stream Flow



APPENDIX E

Public Comments and Responses

PUBLIC COMMENTS AND RESPONSES

TMDLs FOR PHOSPHORUS, COPPER, AND ZINC FOR THE POTEAU RIVER NEAR WALDRON, AR

January 10, 2006

Comments that were received by EPA during the public comment period are shown below with EPA responses inserted in a different font.

COMMENTS FROM TYSON FOODS, INC.:

The Arkansas Department of Environmental Quality (ADEQ) recently published proposed changes to the Impaired Waterbodies List (303d list) on February 20, 2005. Since that time, the Arkansas information has been forwarded to EPA. Currently, EPA Region 6 has prepared 43 TMDLs and the calculations for these TMDLs for waters listed in the state of Arkansas under section 303(d) of the Clean Water Act (CWA). EPA is allowing comments on the 43 proposed TMDLs until December 12, 2005.

Tyson Foods (Tyson) is respectfully submitting this letter to offer comments regarding one of the streams included on the proposed 303(d) list. This stream is the Poteau River which is located near a Tyson process facility in Waldron, AR. The Poteau River is listed as a Category 5A for Total Phosphorus and Nitrates and a 5C for Copper and Zinc. Tyson provides comments on each of these pollutants as follows:

The determination of aquatic life impairment in the Poteau River, below the Waldron point source dischargers, was made using data from a 1994 study completed by the Arkansas Department of Pollution Control and Ecology (ADPC&E). Since that time Tyson Foods has significantly upgraded their treatment facilities. This data is too old to be representative of current conditions in the Poteau River. It is therefore unreasonable to assume the same level of "impairment" exists in the Poteau River as existed then. Follow up macroinvertebrate collections have been completed by ADEQ in the Poteau River below the discharges (October 1, 2002). It does not appear that results from these collections were considered in the TMDL. The subsequent collections in the river were made at different locations than the 1994 collections; and no upstream reference stations were sampled. The TMDL process should not proceed until a determination can be made that the Poteau River has current aquatic life impairment. Loading restrictions for phosphorus, such as required by this TMDL, should not be imposed on the City of Waldron or Tyson Foods if they are not currently necessary.

Response: The determination of impairment for this reach of the Poteau River was originally made by ADEQ a number of years ago. Even with the additional macroinvertebrate collections, ADEQ apparently still considers this stream to be impaired because they included it in

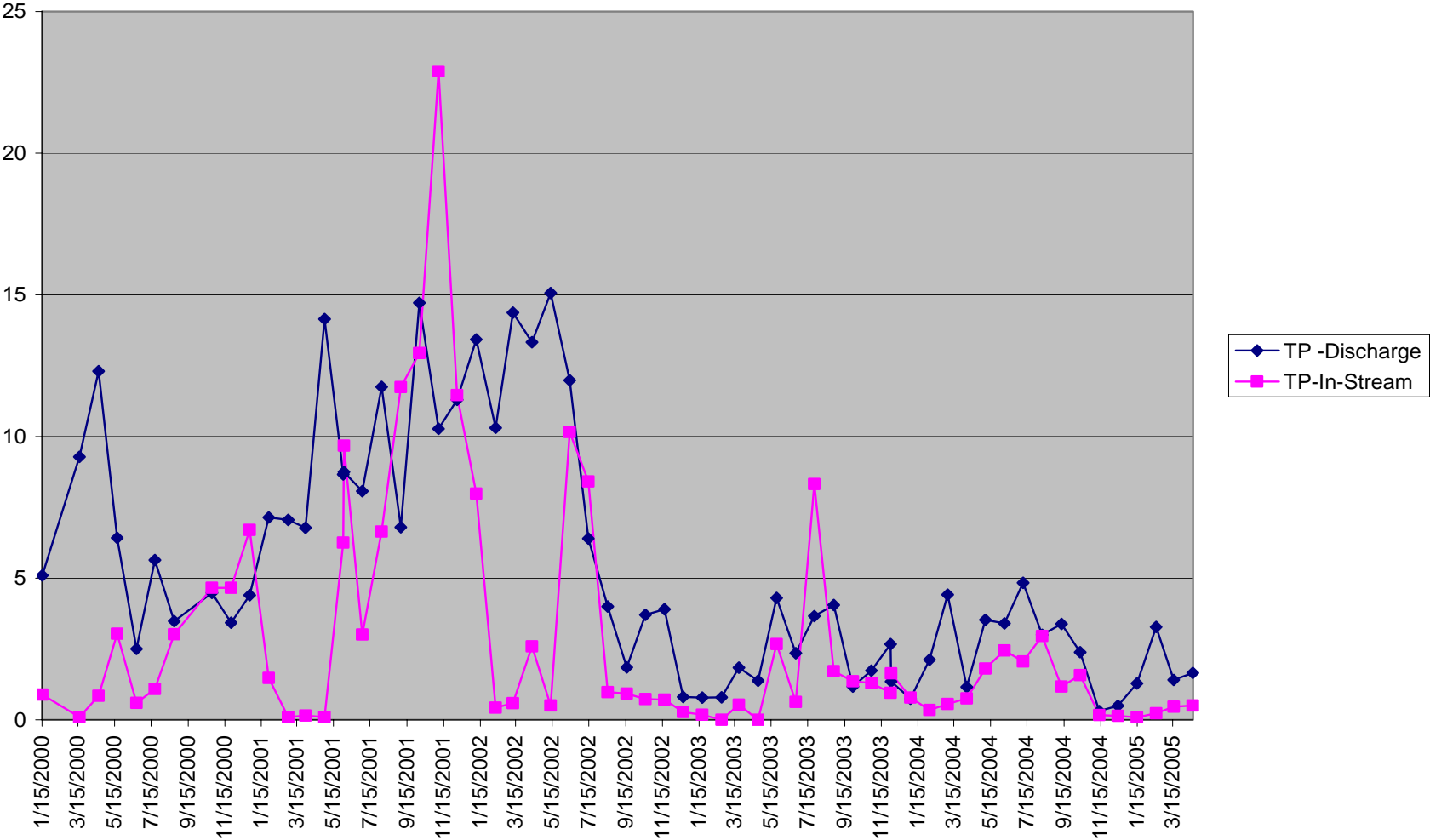
category 5a (for phosphorus and nitrate) on the 2004 draft 303(d) list. The additional macroinvertebrate data were not mentioned in the TMDL report because EPA was unaware that the data existed and was never informed by ADEQ that the data existed. The additional macroinvertebrate data are relevant for determining impairment, which is the focus of the 303(d) list. The focus of this TMDL report is to calculate allowable loadings, which are not directly affected by the macroinvertebrate data. If a more appropriate numeric endpoint is developed in the future, this TMDL can be revised at that time.

Tyson provides comments concerning Phosphorus as follows:

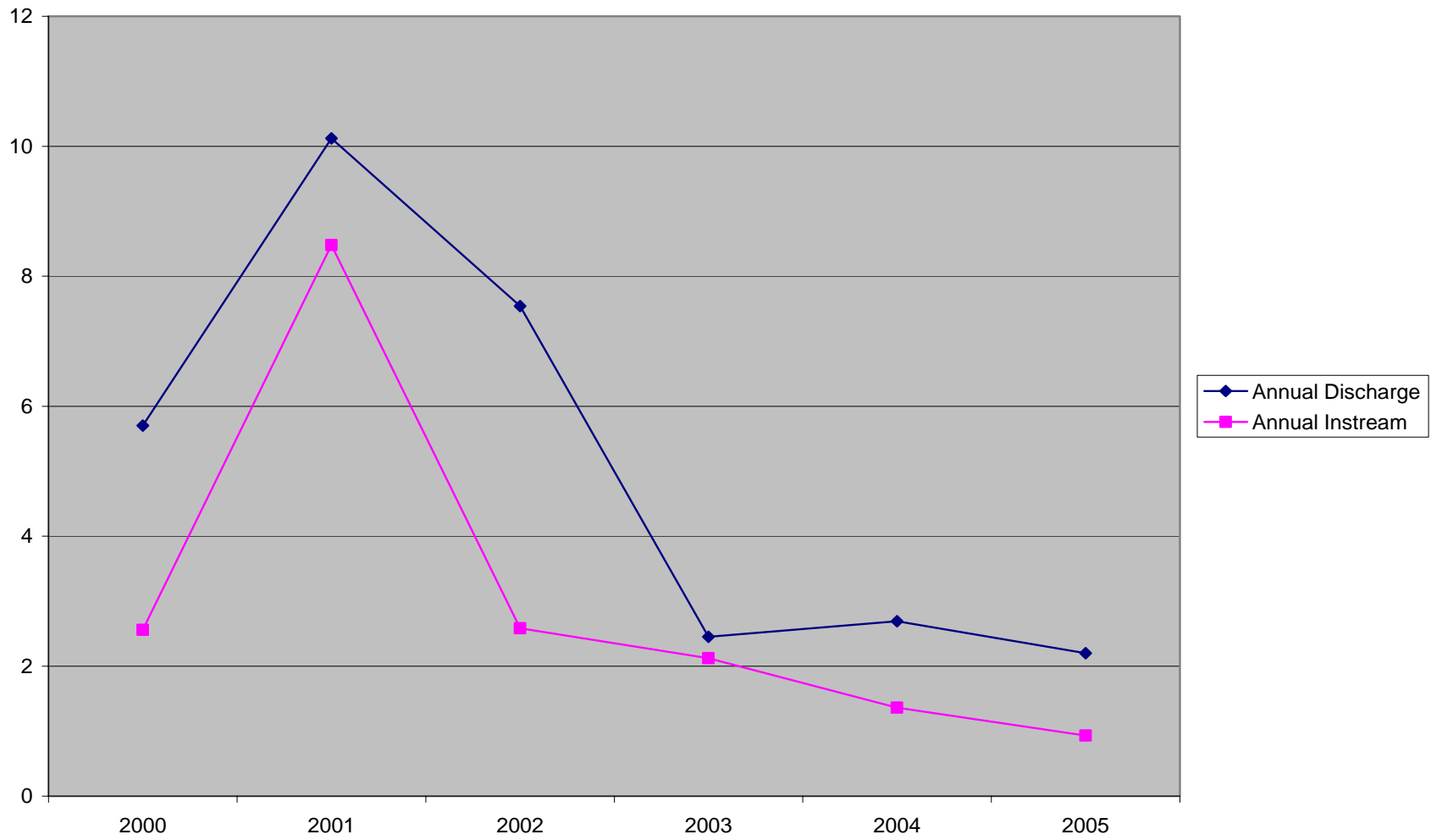
The Tyson-Waldron facility began reducing its phosphorus discharge levels in 2002. Attachments A and B are graphs that compare phosphorus effluent levels and in-stream phosphorus concentrations for the Poteau River. The graphs indicate the voluntary measures that Tyson has implemented have been effective and the phosphorus concentration levels in the stream continue to decline. Based on this data, Tyson requests that the stream continue to be monitored for phosphorus and re-evaluated. This pollutant should be re-classified to 5D to determine if a TMDL is needed.

Response: EPA commends Tyson for reducing its phosphorus discharge levels. ADEQ still considers this stream to be impaired (as mentioned above). TMDLs are required for impaired streams. EPA agrees that the graphs in Tyson's attachments A and B (shown on next two pages of this document) indicate a decrease in effluent and instream phosphorus concentrations over several years. However, the graph in attachment B also shows that the average instream phosphorus concentration during 2005 is still approximately an order of magnitude greater than the target concentration of 0.1 mg/L used in this TMDL. This stream should continue to be considered as impaired until there is sufficient evidence to clearly indicate otherwise.

Attachment A



Attachment B



The basis for the phosphorus target for the TMDL is not a valid numerical water quality standard, is not scientifically derived implementation of a narrative water quality standard, and is not appropriate endpoint for a TMDL for the Poteau River. The 0.1 mg/L phosphorus target is not supported in the Arkansas standards. As acknowledged in the TMDL the 0.1 mg/L total phosphorus value was removed from the water quality standards. The value has never been a water quality standard but rather was used as a “guideline” for certain waters of the state. The 0.1 mg/L phosphorus target is not technically defensible and certainly is not appropriate for Arkansas River Valley streams such as the Poteau River which are more turbid and can assimilate more phosphorus than streams found in the Mountain and Highland Ecoregions of Arkansas. EPA supports the idea that the 0.1 mg/L target is not appropriate in all Ecoregions in Arkansas (EPA Rationale for making Listing Decisions, Region 6). “In their Rationale for Listing Decisions EPA states that “EPA did not believe that application of the guideline values (i.e., the 0.1 mg/L phosphorus guideline for streams) was an appropriate approach.”

The TMDL acknowledges that the 0.1 mg/L phosphorus guideline does not currently exist, but states that “it is still a reasonable benchmark for evaluating phosphorus levels in streams for the protection of aquatic life.” This assumption is incorrect as there is no documented relationship between 0.1 mg/L phosphorus and protection of aquatic life that could be applied in the Poteau River situation. This point is further illustrated by the ADEQ in their public response to comments made in the April 9, 2004 Responsiveness Summary to Comments received from the Public Concerning proposed Changes to Regulation No. 2. In this document the ADEQ states that “Based on years of water division field data, the relationship between nutrient concentration and impairment is not necessarily directly correlated for streams. Therefore, at this time we feel numeric criteria are not appropriate.” Furthermore, in their amendments to Regulation No. 2 the ADEQ has added language for determining impairments due to nutrients that considers factors such as “water clarity, periphyton or phytoplankton production, dissolved oxygen values, dissolved oxygen saturation, diurnal dissolved oxygen fluctuations, pH values, aquatic life community structure and possibly others.” With the exception of the decade old biological assessment, none of the listed determining factors were considered in the development of the TMDL target. Therefore, based on the latest regulations of the ADEQ with input from EPA the target for this TMDL is outdated and technically inappropriate. Without a valid phosphorus target as the basis for the TMDL, the resulting TMDL must also be invalid.

There has been no substantiated scientific link made between phosphorus levels and aquatic life impairment. This is noted in the TMDL report. In addition, there are several examples of streams in Arkansas that have phosphorus levels above 0.1 mg/L and still maintain all aquatic life uses. Several of these streams are clear running Highland streams which would be expected to be impacted more readily (increased algal growth, etc.) than a more turbid stream given the same phosphorus levels. For example, collections completed in the Illinois River near the Oklahoma State Line and on Osage Creek downstream from phosphorus discharges all were found to have good communities of macroinvertebrates with total phosphorus concentrations exceeding 0.2 mg/L on average (ADPC&E, 1997). Two stations on Osage Creek (OSG03 and OSG04) even exhibited

total phosphorus levels averaging 0.4 mg/L or higher during the study period, yet still contained good macroinvertebrate communities (ADPC&E, 1997).

Response: The phosphorus TMDL in this report is being established to maintain Arkansas' narrative criteria for nutrients. Establishing a TMDL to comply with narrative criteria requires the development of a numeric endpoint. The endpoint for this TMDL is an estimate of the phosphorus that the stream can have and still maintain the aquatic life designated use. The 0.1 mg/L endpoint used in this TMDL was considered by EPA to be a reasonable goal that is not overly stringent. If a more appropriate numeric endpoint is developed in the future, this TMDL can be revised at that time.

EPA agrees with the statements above that aquatic life impairments are usually due to a number of other factors in addition to phosphorus concentrations. The list of factors quoted above is presented in Regulation 2 for the purpose of determining impairment rather than developing TMDLs. The determination of impairment for this stream did rely on several different factors. The TMDL in this report is focused on phosphorus concentration as the endpoint rather than on other indicators of aquatic life impairment (e.g., large diurnal fluctuations of DO and pH, etc.) because the 303(d) listing for this stream cited phosphorus as a cause of impairment. Other indicators of aquatic life impairment are often the result of elevated phosphorus concentrations.

The comments above state that aquatic life is not impaired in some streams that have phosphorus concentrations above 0.1 mg/L, such as Osage Creek in the Illinois River basin. EPA disagrees with this specific example. EPA considers aquatic life to be impaired in Osage Creek in the Illinois River basin, as indicated by EPA's addition of that stream to the Arkansas 2002 Section 303(d) List. EPA believes that the ADEQ 1997 study mentioned in the comments above indicates impairment of aquatic life in Osage Creek based on the combined results for periphyton quantities, macroinvertebrate communities, and fish species (EPA 2003). Another study of the Illinois River basin was conducted by Parsons and the University of Arkansas (UA) in 2003-2004. The Parsons/UA study characterized several sampling stations along Spring Creek and Osage Creek in the Illinois River basin as "severely impacted" and "impacted". The sampling stations in the Parsons/UA

study with the greatest level of impact were the same stations that had the highest phosphorus concentrations. The results of the Parsons/UA study, along with other research and data for streams in this area, demonstrate that elevated phosphorus concentrations definitely contribute to aquatic life impairments.

The 1994 study completed by ADPC&E included macroinvertebrate and fish collections in the spring of 1994 (May 23) and the late summer of 1994 (August 30). The ADPC&E relied mostly on the macroinvertebrate collections in their impairment determination as the fish communities downstream were not noticeably different to those upstream. A closer review of the study data revealed that the spring macroinvertebrate collection was actually found to be only “minimally impaired” and thus in support of the aquatic life use. Only the late summer collection was found to be “substantially impaired” and therefore considered “not supporting” the aquatic life use.

The decision criteria used to assess aquatic life impairment following the 1994 study was the biometric scoring system described in Shackleford, 1988. In this scoring system a total of 7 metrics are calculated and used in a comparison basis between the upstream reference station and the station downstream of a discharger. Each metric earns a score between 1 and 4, dependant on its value calculated from the comparison. The higher scores indicate similar communities and the lower scores dissimilar communities. An average score of ≥ 2.6 indicates minimal to no impairment and indicates support of the aquatic life use. An average score of below 2.6 indicates substantial or excessive impairment and indicates non-support of the aquatic life use.

Further analysis of the 1994 study results reveals that the impairment decision process was not followed in the Poteau River situation. Only 5 of the 7 metrics were used in the biometric scoring system by ADPC&E in their analysis of the summer of 1994 macroinvertebrate data from the Poteau River. When the additional two metrics were properly calculated and added to the biometric scoring system, the summer collection is also found to be supporting the aquatic life use. In light of this information the segment of the Poteau River below the Waldron dischargers should have never been on the 303(d) list for not supporting the aquatic life use. The stream should be removed from the 303(d) list and the TMDL process discontinued. At a minimum, the TMDL for phosphorus should be suspended and metals addressed through normal NPDES permitting processes as warranted.

Response: ADEQ decided to put the phosphorus impairment for Poteau River in category 5a of the 2004 draft 303(d) list. A detailed discussion of the impairment determination was not included in this report because the focus of a TMDL report is to calculate allowable loadings, not determine impairments.

Tyson provides comments concerning Nitrates as follows:

Tyson has not collected a significant amount of data on Nitrates discharged from the Waldron facility. However, Tyson has modified its wastewater treatment system and has implemented denitrification efforts. Tyson believes that processes ongoing at the facility will continue to decrease nitrate levels. Due to a lack of data, Tyson cannot compare with the in-stream Nitrate data to effluent discharge levels. Therefore, Tyson is not able to determine if the Waldron facility is the primary contributor of Total Nitrogen in the stream. Tyson believes that additional data must be collected. Tyson requests that the Designated Category be changed from 5C to 5D to allow time for additional data collection to determine both the source and the level of impact.

Response: These comments are not relevant to the TMDLs in this report because a nitrate TMDL was not developed.

Tyson provides comments concerning Copper and Zinc as follows:

Metals data (for copper and zinc) provided in the TMDL indicate that the levels downstream of the Tyson Foods and the City of Waldron discharges are in excess of water quality standards for the metals. There is no discussion of sampling techniques associated with the metals data so it is not known if clean techniques sampling was used for collection of the data referenced in the TMDL. If clean techniques sampling was not used for collection of this data then it can not be determined if an actual exceedance of the water quality standards actually exists or is an artifact of sampling technique. The metals assessment and the subsequent waste load allocation presented in the TMDL are based on a regulatory flow of 0 cfs and ecoregion default values for hardness and TSS. Although there is no properly presented evidence of any aquatic life impairment, should an exceedance of a water quality standard for a metal exist, the NPDES permitting process is an appropriate forum for development of water quality based limits and the TMDL process is not necessary to address the situation.

Response: The TMDL process is the appropriate, and required forum for addressing this situation. The reason for this is because the metals impairment for this reach of the Poteau River has been on the 303(d) list since at least 1998 and it is included in the consent decree from the Arkansas TMDL lawsuit.

If water quality based permit limits are needed to ensure standards compliance then available site specific data should be used in development of the copper and zinc waste loads (40 CFR 130.7). As noted in the TMDL report site specific data is available for hardness and for TSS (ambient monitoring station ARK0055). The point source discharges listed in the TMDL are already limited by the conservative use of a 0 cfs background flow, which would rarely occur. Metal concentrations for use in the waste load allocations (WLA) calculated using the site specific data for TSS and hardness are provided in the table below.

Metal	Option			
	0	1	2	3
	Existing TMDL (µg/L)	Using 15 th %tile TSS ¹ (µg/L)	Using 15 th %tile TSS/median hardness ² (µg/L)	Using 15 th %tile TSS/mean hardness ³ (µg/L)
Copper	9.2	10.3	13.7	14.4
Zinc	85.5	99	131	138

¹15th %tile TSS is 6 mg/L from ambient monitoring station ARK0055.

²median total hardness is 35 mg/L from ambient monitoring station ARK0055.

³mean total hardness is 37 mg/L from ambient monitoring station ARK0055.

The use of site specific TSS and hardness data provides for higher waste load allocations for each discharger and in the case of option 4, results in no reasonable potential for water quality standard exceedance for zinc (using DMR data provided in the TMDL report from 2004-2005) by Tyson Foods. Therefore, Tyson Foods limit for zinc, as provided in the TMDL, could be eliminated. Further study of the site specific conditions in the Poteau River, as would be accomplished with development of a water effect ratio, would likely show that copper also has no reasonable potential of causing toxic effects (neither acute nor chronic) in the river downstream of the dischargers. Note that the in-stream hardness under conditions of 0 cfs background flow would be controlled by effluent hardness which should be even higher than that used in the table above, therefore, allowing these recommendations to remain conservative. Again, the appropriate forum for development of water quality based limits for metals is the NPDES permitting process and a TMDL is not necessary to address the apparent exceedance of water quality standards for copper and zinc.

Response: The numeric criteria that were used for the metals TMDLs in this report were calculated using ecoregion default values of TSS and hardness because that is ADEQ's standard protocol as documented in the ADEQ Continuing Planning Process (CPP) document. It is EPA's understanding that one reason why ADEQ uses ecoregion values for hardness is that the hardness of a stream often changes along the length of a stream. ADEQ and EPA have seen situations where hardness is high immediately downstream of a discharge but decreases farther downstream.

Metals data collected using typical routine monitoring protocols has often been found to be substantially higher than that collected using clean techniques. As such, actual in-stream and effluent concentrations of copper and zinc may be significantly lower than those reported. Utilizing these likely higher values as the basis for a TMDL poses an unreasonable level of conservatism on the waste load allocation for each discharger. Since there appears to be no true aquatic life impairment observed in the biota (see bullet

4 above) there is no basis to assume that the metals levels observed are appropriately elevated to cause an in-stream acute or chronic reaction.

Response: The observed data for metals in the Poteau River were not used to calculate the allowable concentrations and loads of metals. The allowable concentrations and loads were calculated using the numeric criteria for the stream and the flow rates (effluent and upstream). EPA agrees that clean sampling techniques are appropriate for evaluating metals concentrations in this stream for assessment purposes.

Assumption of a background flow of 0 cfs is inconsistent with the copper and zinc load allocation (for non-point sources). Non-point source loading of these metals would only occur during times of high flow. The LA for copper and zinc should be eliminated during the critical season (May-October) and the remaining load provided to the dischargers. Seasonal consideration should be given to any TMDL developed for metals as the higher primary season flows would allow for higher point source WLA's while still maintaining the in-stream standard. In the case of the Poteau River increasing the background flow from 0 cfs to just 1 cfs allows the Tyson discharge to pass reasonable potential for both metals, therefore not requiring a limit during at least the primary season (November-April).

Response: As explained in Section 4 of this report, the copper and zinc load allocations for nonpoint sources were based on the average annual flow rather than the 7Q10 flow. However, the load allocations for point sources were based on the annual 7Q10 flow because both point sources currently have year-round limits that do not vary with stream flow rate. Allowable loads of copper and zinc must be calculated to prevent toxicity under critical conditions. Using an average upstream flow rate to calculate allowable point source loads would allow toxicity to occur whenever the upstream flow rate was less than the average value.

The procedures cited in the TMDL report for WLA and LA development were not followed through. In the TMDL Development for Phosphorus Section (Section 5.0) the step-wise procedure for WLA and LA development was explained. In this procedure, the TMDL was set as the in-stream target (0.1 mg/L) times the average annual flow, which resulted in about 48 lb/day. As stated, the second step was subtraction of a 10% margin of safety from the TMDL, and then the remaining load was used to calculate a WLA for the dischargers. It is stated that the WLA was first calculated as a 2.0 mg/L effluent concentration (as per 2007 requirements) and the design flow of the dischargers; but this WLA "...exceeded the available loading (the TMDL minus the MOS)" so an alternative, more conservative effluent concentration was used.

However, if the stepwise procedure described in the report was actually used, the WLA for the dischargers would be 35 lb/day, rather than the 22.7 lb/day provided in the report. This still leaves at least 7.96 lb/day before the TMDL is reached. It appears that in fact the load allocation (LA) was actually derived first, and the remaining loading given to the dischargers. The load allocation is described in the report as "...calculated as the remaining available load after the WLA and the MOS were subtracted from the TMDL." When this error is corrected it provides a new WLA of 35 lbs/day and a LA of 7.96 lbs/day. The additional 12.3 lbs/day gained in the WLA should be appropriately allocated to the dischargers.

Response: The procedure for calculating the phosphorus TMDL components was an iterative process for this waterbody. If allowable phosphorus loads for both dischargers were based on a concentration of 2 mg/L, the allowable nonpoint source load would have been 7.96 lbs/day, which corresponds to a concentration of 0.017 mg/L (using the average annual ambient flow of 55.1 MGD from Section 5.3 of this report). This phosphorus concentration (0.017 mg/L) is not realistic for nonpoint source inflow to the Poteau River and would require a 73% reduction of existing nonpoint sources of phosphorus (based on the existing median concentration of 0.065 mg/L at ARK0054). When this report stated that allowable point source loads were calculated prior to the allowable nonpoint source loads, it did not mean that the point sources were automatically assigned as much load as they wanted. If the point sources want to trade allocations between themselves or with nonpoint sources in the future, that is allowable with a revision of this TMDL. This TMDL report establishes the total maximum loading, but it does not prevent reallocation of loads in the future between individual sources.

Tyson concurs with the additional data confirmation for metals. Tyson will continue to monitor the metals levels being discharged from the Waldron facility as outlined in the NPDES permit. Since the issuance of the NPDES permit, all Copper levels have been below the detection level and the zinc levels have ranged between 0.03 and 0.1mg/l. Tyson had no data to review related to Copper or Zinc in the receiving stream since the NPDES permit was issued.

Tyson is requesting to work with ADEQ and EPA on assessing the water quality impacts associated with discharges from the processing plant mentioned in this letter. In the event that ADEQ determines that the processing plant is contributing to water quality impairments, Tyson would prefer to develop additional voluntary procedures in lieu of developing a TMDL. If you have any questions related to these comments please contact me at (479) 290-7541 or John Couch at (479) 986-1276.

Tyson Foods would like to request a meeting with EPA to further discuss and clarify the points made above. Tyson requests that such a meeting be scheduled prior to the potential adoption of a TMDL for the Poteau River. My contact information is listed below.

Response: After these comments were received, EPA discussed these comments with the author of the letter by telephone on December 14, 2005. EPA will gladly discuss the TMDL with Tyson Foods further and answer any questions concerning the TMDL.

COMMENTS FROM ARKANSAS DEPARTMENT OF ENVIRONMENT QUALITY:

The Water Division staff has completed its review of the following draft TMDLs: Nitrate and Phosphorus in Rolling Fork; Phosphorus in Osage Creek near Berryville, Ar.; Phosphorus, Copper and Zinc for the Poteau River near Waldron, Ar.

Our comments are as follows:

In each of these studies, the value utilized as the phosphorus removal target is not a numerical water quality standard. In previous versions of Regulation #2, phosphorus was mentioned as a guideline, but was not--and is not--technically defensible due to varied (by ecoregion and individual watershed) responses by aquatic communities to instream nutrient concentrations. As a result, this guideline has since been removed in Arkansas' current water quality standards. TMDL validity must be based on addressing documented violations of existing Arkansas water quality standards and impaired use.

Response: The phosphorus TMDL in this report is being established to maintain Arkansas' narrative criteria for nutrients. Establishing a TMDL to comply with narrative criteria requires the development of a numeric endpoint. The endpoint for this TMDL is an estimate of the phosphorus that the stream can have and still maintain the aquatic life designated use. The 0.1 mg/L endpoint used in this TMDL was considered by EPA to be a reasonable goal that is not overly stringent. If a more appropriate numeric endpoint is developed in the future, this TMDL can be revised at that time.

EPA agrees with the statements above that aquatic life impairments are usually due to a number of other factors in addition to phosphorus concentrations. The list of factors quoted above is presented in Regulation 2 for the purpose of determining impairment rather than developing TMDLs. The determination of impairment for this stream did rely on several different factors. The TMDL in this report is focused

on phosphorus concentration as the endpoint rather than on other indicators of aquatic life impairment (e.g., large diurnal fluctuations of DO and pH, etc.) because the 303(d) listing for this stream cited phosphorus as a cause of impairment. Other indicators of aquatic life impairment are often the result of elevated phosphorus concentrations.

The comments above state that aquatic life is not impaired in some streams that have phosphorus concentrations above 0.1 mg/L, such as Osage Creek in the Illinois River basin. EPA disagrees with this specific example. EPA considers aquatic life to be impaired in Osage Creek in the Illinois River basin, as indicated by EPA's addition of that stream to the Arkansas 2002 Section 303(d) List. EPA believes that the ADEQ 1997 study mentioned in the comments above indicates impairment of aquatic life in Osage Creek based on the combined results for periphyton quantities, macroinvertebrate communities, and fish species (EPA 2003). Another study of the Illinois River basin was conducted by Parsons and the University of Arkansas (UA) in 2003-2004. The Parsons/UA study characterized several sampling stations along Spring Creek and Osage Creek in the Illinois River basin as "severely impacted" and "impacted". The sampling stations in the Parsons/UA study with the greatest level of impact were the same stations that had the highest phosphorus concentrations. The results of the Parsons/UA study, along with other research and data for streams in this area, demonstrate that elevated phosphorus concentrations definitely contribute to aquatic life impairments.

Specific comments include (1) the stream segment below the Tyson discharge to Rolling Fork has had the domestic water supply source designation removed, thereby invalidating the instream TMDL target for nitrate-nitrogen, (2) the current 303d listing for metals in the Poteau River at Waldron is in the 5c category, which indicates questionable data due to QA/QC procedures, and may be resolved due to refinement of sampling techniques, and (3) the Osage Creek TMDL (Berryville) contains numerous errors, erroneous data and inaccurate loading calculations.

Response: Only the second of the three comments above pertains to this report. As mentioned in the responses to comments from Tyson Foods (pages 8-9 of Appendix E), TMDLs for zinc and copper were required because these impairments have been on the 303(d) list since at least 1998 and are included in the consent decree from the Arkansas TMDL lawsuit. Comment 1 above is addressed in the separate document, "TMDLs for Nitrate

and Phosphorus in Rolling Fork." Comment 3 above is addressed in the separate document, "TMDL for Phosphorus in Osage Creek near Berryville, AR."

All three of these point source dischargers have voluntarily agreed to develop/utilize technologies that effectively reduce nutrient loads to the receiving streams. ADEQ commends their willingness to initiate these procedures that will serve to enhance the protection of the instream aquatic communities, and prefers this approach to potential requirements dictated by technically invalid TMDLs.

The Water Division looks forward to continuing our long-standing working relationship with EPA. If you have any questions regarding the above comments, please feel free to contact me.

Response: EPA also commends the point sources for voluntary efforts to reduce nutrient loading to the receiving streams. The allowable point source concentrations developed in this TMDL are similar to permit limits that were already required by Regulation No. 2.